Natural Resource Summary for
Big Thicket National Preserve (BITH)
Final Report
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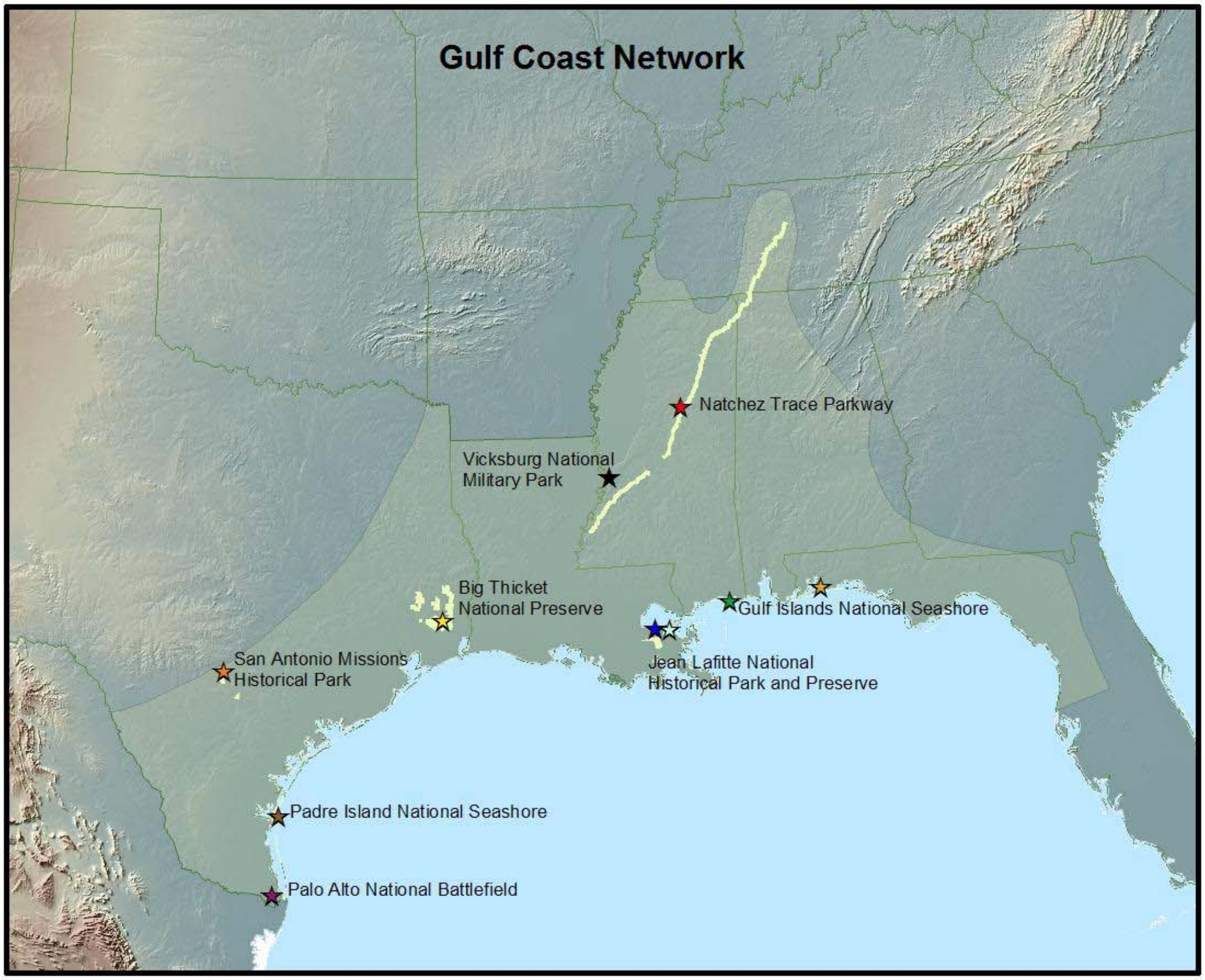

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EXECUTIVE SUMMARY

Big Thicket National Preserve (BITH) was established in 1974 and consists of nine separate land units and six water corridors that lie in a region with a high biological diversity due to the convergence of three ecosystems, the eastern hardwood forest, the Gulf coastal plains, and the Midwest prairies. The ecology of the area in and adjacent to BITH has been described as one of the most diverse habitats in North America due to the influence of habitats from the north, south, east, and west on the biological community. BITH has also been designated as an International Biosphere Reserve by the United Nations Education, Scientific and Cultural Organization Man and the Biosphere Program and as a Globally Important Bird Area by the American Bird Conservancy.

The plant communities and vegetation types found in BITH have been documented and described in many reports. These studies varied in focus from the general diversity and community structure to documentation of new species for the area and have been conducted in the Big Thicket region as well as BITH and its individual units. One of the earlier reports by Harcombe and Marks (1978b) provided a concrete definition and description of the park's plant communities and vegetation types. A second report by a local naturalist, Geraldine Watson, created summaries of the vegetation types, plant species, and the ecological characteristics for each species such as habitat associations, soil type, fire tolerance, etc. for each of the BITH units. Watson also listed the rare species detected in each unit of BITH, their status (endangered, threatened, etc.), general abundance within the park, and comments on the species or populations. A recent review of the status of the voucher specimen collection of all vascular plants in BITH found specimens from over 1100 species, which is three-quarters of the species that are thought to exist in the park. Approximately 1,000 species were documented through voucher specimens during 1998 through 2000 in three of the BITH units, Beaumont, Jack Gore Baygall/Neches Bottom, and the eastern half of Lance Rosier. A previous study compared three herbarium collections of BITH plants with Watson's checklist of vascular plants for BITH. They only found a voucher specimen for about 47% of Watson's list and found 72 vouchers for specimens not on the original checklist.

A number of additional studies have examined the environmental factors that affect the vegetation communities. These studies have examined the different communities, regulating forces which maintain them, and catastrophic events which affect them. Fire and moisture have been found to be two important factors that have caused long-term changes in the dominant species in the forested habitats.

A recent compilation of data from past research and published literature that characterized the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians, documented 48 species listed as endangered, threatened, rare or of concern in the counties in which the park units exist. Currently there are 36 Federally or State listed plant and animal species that have been documented in or are possible inhabitants of BITH, including two plants, four mammals, six reptiles, one amphibian, 17 birds, five fish, and one insect.

A number of studies have been conducted on the mammal populations at BITH. However, much of this information has focused on the game species, much of which is at least 20 years old. Fewer studies have been conducted on non-game species. Some of these studies were conducted over large areas with portions of the project conducted in BITH. A review of some of this earlier research found that 52 mammal species have at some point occupied the BITH; 8 of those species have been extirpated from the area. More recent studies have examined the suitability of BITH for black bear habitat and the examined current distributions, correlated vegetative communities with habitat use and studied parameters of roost sites of the southeastern myotis and Rafinesque's big-ear bat.

There is very little documented information on the herpetofauna of BITH. One general survey was conducted in the park almost 30 years ago and documented 54 species of herpetofauna of the park. Based primarily on these diurnal surveys, the 1996 Resource Management Plan (RMP) states that there are 92 herpetofaunal species that occur in BITH. Several additional studies have examined the ecology, distribution, and/or effect of anthropogenic activities on individual reptilian species or groups of species in the BITH or Big Thicket area but there have been no studies on individual species of amphibians in the park. No recent herpetological surveys have been conducted, aside from a survey of Big Sandy Creek Unit that documented 40 species that varied with the forest type and was influenced by moisture availability. According to some estimates, approximately one-third of the herpetofaunal species existing in Texas, or 85 species, could exist within the BITH. Snakes represent the most diverse group with over one-half of the Texas species inhabiting the park.

Multiple avian surveys have been conducted in the park although many date back to the late 1970's and early 1980's. One such survey was conducted as a part of a larger faunal survey that also included invertebrate and herpetological surveys and documented 290 species within the park. Additional studies documented between 109 and 188 bird species in the park and in surrounding areas. Several volunteer-based surveys, including the Breeding Bird Survey and the National Audubon's Christmas Bird Count, have occurred in or near the park and are conducted yearly with some beginning as early as the late 1960's. Aside from these surveys, there have been no recent organized monitoring programs to examine the avifauna of BITH.

A number of other smaller bird surveys were conducted in individual units or areas adjoining the park. Individual species studies have examine three bird species in BITH due to their federal status, including the Ivory-billed Woodpecker, Red-cockaded Woodpecker (RCW), and the Wild Turkey. Despite sightings in the recent past, Ivory-billed Woodpecker is currently thought to be extinct, RCW populations have disappeared from the park, and attempts to reintroduce Wild Turkey into the park have not been extremely successful.

Because so much of BITH is centered on waterways, there have been a great number of studies conducted on the fish and aquatic invertebrates within the park. Much of this work has focused on the water quality and resulting affects on the aquatic communities.

Fish have been generally well studied in BITH compared to most other taxa. A variety of reports have examined the fish community through summaries, general surveys (both individual unit and parkwide surveys), and individual species studies. Some recent surveys have also been conducted in conjunction with water quality surveys. A study of park waterways during the 1970's documented 85 species of fish and their distributions in BITH, including 34 species in each Hickory Creek and Turkey Creek, 39 species in Big Sandy Creek, 47 species in Village Creek, and 29 species in Menard Creek. Based primarily on this study, the 1996 RMP states that there are 97 species of fish documented within the park. Additional studies have examined the direct and indirect effects of the anthropogenic alterations to the park's waterways on the ecology and distribution of fish species. One such study documented 69 species of fish and found that flooding, drought, and migration were more important in determining distribution than temperature, gradient, and environmental variation. A second found that fish species richness was not significantly correlated with landuse or habitat. The latest long-term study found a total of 65 species in Village and Flat Branch Creeks but found no trends in diversity on the fish assemblages in either stream from 1977 to 2000.

A number of researchers have examined the aquatic invertebrates of BITH including Lewis, Kost, and Harrel. From these studies, 151 taxa have been documented in Village Creek, 172 in Beech Creek, 125 in Menard Creek, 107 in Turkey Creek, and 171 in Big Sandy Creek. As of 2000, 249 species of macroinvertebrates have been documented during comprehensive surveys in the Village Creek drainages alone. These studies generally found a diverse macrobenthic fauna that indicated good to excellent water quality. In an examination of the water quality for multiple waterways in the BITH, including Little Pine Island and Pine Island Bayous, Beech, Turkey, Big Sandy, and Menard Creeks, researchers found streams generally had high water quality and a high diversity of macrobenthos but levels indicated a moderately stressed community. A recent water quality study of the structure and function of the faunal community and habitat associations as they relate to landuse in the upstream drainage in BITH, found arthropod communities were not significantly correlated with landuse or habitat.

A number of surveys have also been conducted on the terrestrial invertebrate populations in the park, although many of them were conducted over 20 years ago. Most studies have focused on the ecology of an individual species or group, although a few surveys have been conducted on the general species diversity of a unit or diversity of a group of species parkwide.
A survey of one unit, Turkey Creek, used a variety of sampling techniques including light traps, sweep nets, and searching and catching, and documented 396 species. Lepidopteran species have also been well studied. In addition to ecological studies of the pipevine swallowtail butterfly, over 1300 species of Lepidoptera species have been documented in seven of the BITH units and additional sites located within the area between the units. Including the other counties of the Big Thicket, the total species count was over 2000 and represented approximately 40% of the species known in Texas.

There are four primary geologic formations found in BITH; Beaumont, Montgomery, Bentley, and Willis. These formations date back to the Pleistocene and Holocene age and were deposited during fluctuations in sea level. A parkwide soil survey documented over 40 soil series in soils that formed under a forested landscape in BITH. Generally they were found to be light colored and loamy, with some wet or ponded soils, while soils along the Neches River contained more clay. Erosion is not a major problem at BITH.

The primary aquifer for BITH is the Gulf Coast Aquifer and is made up of the Fleming, Willis, Bentley, Montgomery, and Beaumont formations. The water quality in the aquifer has been described as good to excellent and was found to be a significant resource. Various authors also have documented the status and quality of groundwater for the counties that contain the units of BITH. They also found that groundwater was abundant and although the water quality varied according to composition and depth of the water-bearing formations, the water is generally of good quality.

Because most of the units in BITH contain portions of river and stream tributaries as well as associated wetlands, surface water quality has been well studied across BITH. An extensive amount of research has been conducted on the park's surface waters and how anthropogenic disturbances (e.g., dams, saltwater barriers, and sewage) affect the water quality. One relatively recent water quality study in six drainage basins in BITH found that water quality varied across the park. Big Sandy, Turkey, and Village Creeks had the best water quality while Neches River was generally good but had periods with moderate algae blooms. The Pine Island Bayou system generally had poor water quality with high nutrient loads and low velocities. The park contains eight waterbodies that are considered impaired by the Environmental Protection Agency (EPA).

A couple of studies have taken place in BITH to examine the air quality of the park, although much of this monitoring took place 10-20 years ago. The park is located near two non-attainment areas in Texas, Beaumont-Port Author-Orange and Houston-Galveston airsheds. These areas do not meet the National Ambient Air Quality Standards set by the EPA. The 1996 RMP also described the air quality of the park and nearby pressures that directly impact the park's resources. Monitoring efforts in and near BITH have used bioindicators (e.g., lichen and Spanish moss) to examine the effect of air pollution on park resources. Due to the sensitivity of lichens to low sulfur dioxide levels, the lichen community was surveyed to determine if pollution from these neighboring airsheds were damaging park resources. A second study conducted across the Gulf and Southeast states including sites around BITH, sampled for elements found in Spanish moss. During the first study, no evidence was found of lichen damage but the following study detected elevated levels of several metals in samples taken in the nearby industrialized areas. Particulate matter (PM) has also been monitored in the park. Of the 18 sites across Texas in this study, BITH had the highest levels of fine fraction PM. Industrial activity associated with oil and gas production could contribute to these high levels.

BITH is composed of five main forest types with subcategories within; upland pine forest (pine sandhill, pine forests, pine savanna wetland), slope forest (upper slope pine oak, mid-slope oak pine, lower slope hardwood pine), floodplain forest (stream floodplain forest, river floodplain forest, cypress-tupelo swamp), flatland forest (flatland hardwood pine, flatland hardwood), and baygalls. These habitats and the streams that flow through them can be grouped in more general terms into waterbodies and forested lands. Multiple studies have examined the vegetation, water quality, productivity, animal community and effects of saltwater intrusion on these habitats.

Because of the park's proximity to multiple urban centers, including Beaumont and Houston, BITH is subject to many environmental problems, including reduced air and water quality, disturbed lands, hydrologic disruption, exotic species, and pests. Current and past anthropogenic threats that effect BITH include past logging and oil and gas operations, air and water pollution, alterations to flow and quality of rivers, fragmentation of habitat and the continued isolation of the individual park units, invasive non-indigenous species as well as the disruption of natural processes.

This proximity to urban landscapes has also indirectly effected the vegetation and faunal community due to exclusion of fire from the fire-dependent ecosystems in BITH. Park data indicate that fire is an essential component in the maintenance of this ecosystem. Prescribed burns have been recommended findings of multiple studies although some of the more recent studies did not find evidence that pre-fire vegetation would return to previous type. However, this same study found that the Hickory Creek tornado site has shown some reversals of succession due to fires.

Due to the tremendous effect outbreaks of southern pine beetles (SPB) can have on the forest community, a number of studies have focused on the ecology of this species and its effects on forests in the area. These studies found that SPB populations could be aggregated using pheromones and that activity was correlated with soil type. Other studies examined the effects of pheromones on the orientation of flying SPB, landing and boring activities, and the continuation and size of outbreaks, resource utilization, and effectiveness of insecticidal control. Suppression of the population is recommended if it is within ¼ mile of private land or if it threatens to kill cavity trees of RCWs.

A number of exotic species have been detected in BITH including nutria, grass carp, zebra mussels, red imported fire ants, slash pine, Chinese tallow tree, and water hyacinth. The park's close proximity to urban areas also has created problems with stray pets. Unchecked, this can lead to feral populations, i.e., cats, dogs and pigs, which have an unknown impact on native animal populations as well as provide a safety concern for visitors. Although no specific data has been collected, research elsewhere have shown that cats in particular can have a serious effect on the native populations of birds, herpetofauna, and small mammals due to their skilled hunting abilities.

The effects of oil extraction and spills have been well studied in the park. These studies examined oil and gas drilling sites to determine the effect on the vegetation and soils at BITH and found the drilling had negligible long-term effects on the community. The only exception was when foreign materials, generally crushed shells, were used to stabilize soils. Further research found three major physical factors (foreign material, berms, and disruption of water flow) that inhibited regrowth of vegetation around abandoned oil well sites. The time it took for an area to revert to its natural state depended on the diversity of the environment (higher diversity, longer period) and the extent of the disturbance (foreign material and berms). As of 1996 there were 13 active operations in the park as well as two saltwater disposal sites, and six storage tank batteries.

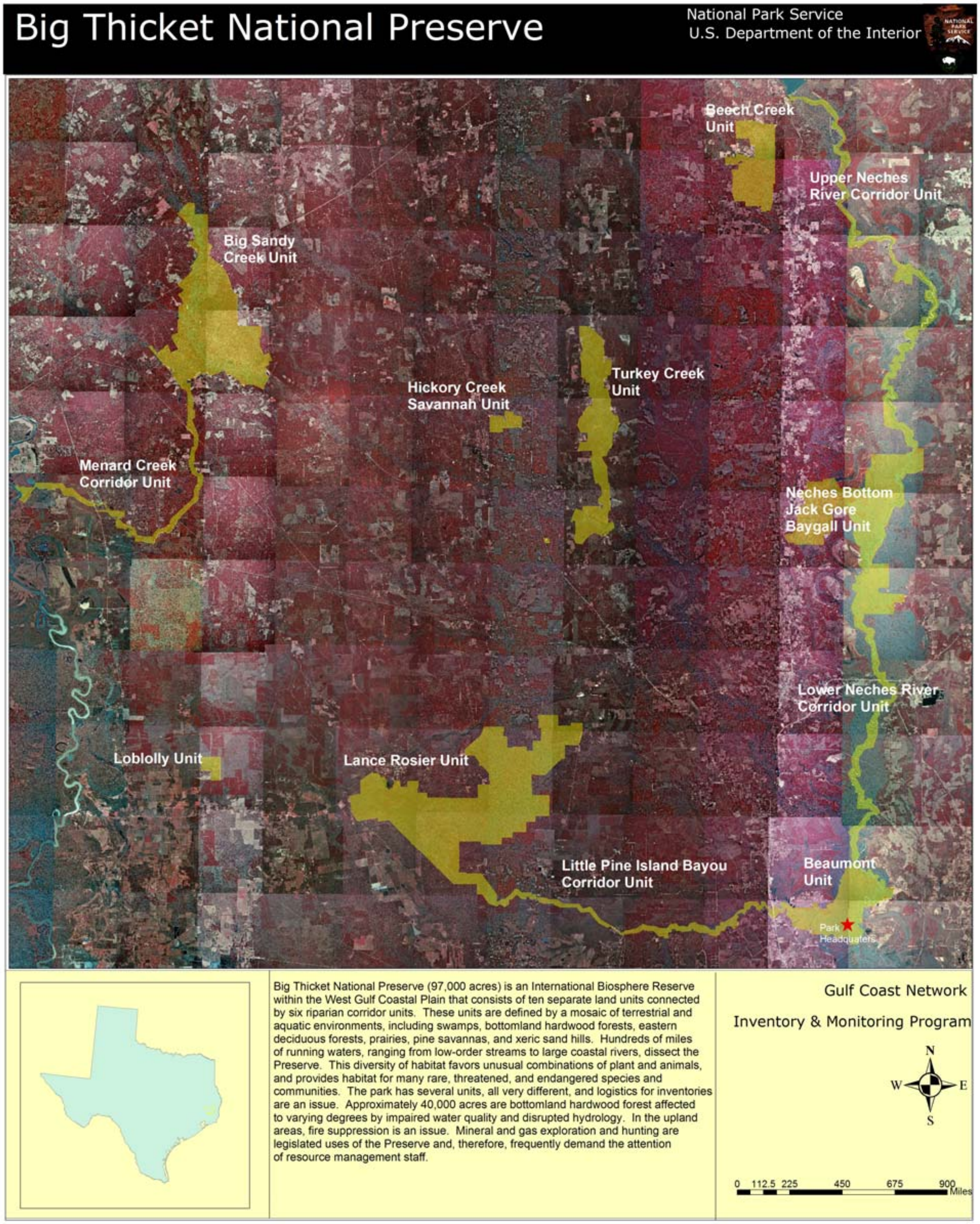

Figure 1. Location and extent of the BITH, one of eight parks in the Gulf Coast Network.

RESEARCH REVIEWS

Big Thicket National Preserve (BITH) was established in 1974 and consists of nine separate land units and six water corridors that lie in a region with a high biological diversity due to the convergence of three ecosystems, the eastern hardwood forest, the Gulf coastal plains, and the Midwest prairies (Figure 1). Teale (1971) described the ecology of the area in and adjacent to BITH as one of the most diverse habitats in North America due to the influence of habitats from the north, south, east, and west on the biological community. BITH has been designated as an International Biosphere Reserve by the United Nations Education, Scientific and Cultural Organization Man and the Biosphere Program and as a Globally Important Bird Area by the American Bird Conservancy.

NATURAL RESOURCES

A number of general natural resource surveys have occurred in BITH or the Big Thicket region. The focus of these surveys varied but examined physical and/or biological resources in the area.

Parks and Cory (1936) conducted an early biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including mammals, birds, reptiles, amphibians, fish, spiders, insects, crayfish, shellfish, and plants. McLeod (1972) described the early history of Big Thicket. He discussed soils, development, general vegetation communities, mapping of the vegetation types (in the upper and lower thicket), and gave a species list of plant species discussed in the report.

A description of the natural environment (geology, hydrology, vegetation, fauna, etc.) was included in the environmental impact statement for the establishment of the park (National Park Service 1976). A list of vegetation types was included (from Harcombe & Marks 1975b), as well as lists of potentially occurring species for mammals (57 species), birds (296 species), fish (100 species), and herpetofauna (77 species). Rare or endangered species also were discussed.

Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. He listed seven habitat associations that exist within the watershed and gave a detailed description for five of them. According to this report, approximately 900 species of plants had been documented in the watershed, including three species whose only records within Texas were this watershed. Species lists for fauna include 68 species of mammals, 296 species of birds, 80 reptile and amphibian species, and 80 species of fish. He also listed 19 endangered species that could exist in the area. Hane et al. (1990) described the natural resources of BITH, including birds, mammals, reptiles, amphibians, fish, and invertebrates and summarized the results of past investigations. Harcombe (1996) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians.

Schultz and Fountain (1982) proposed to conduct a long-term monitoring project that would be consistent with other Biosphere Reserve programs. Since that publication, BITH joined the U.S. Man and the Biosphere Program.

Strahan et al. (1996) summarized the baseline information on the biological resources at the park. They outlined the current knowledge of the biota, listed threatened and endangered species, discussed the major research that has been conducted and addressed potential threats to the natural resources of the park. Harcombe and Callaway (1997b) created a management assessment of the water corridor units in BITH. They described the impact to the resources, recommended management actions, and proposed possible research for biodiversity, endangered species, exotic species, water quality, water flow, woody in-stream substrates, stream banks, and floodplain habitat.

BIOLOGICAL RESOURCES

VEGETATION

A number of studies have been conducted on the vegetation and communities of the Big Thicket region as well as BITH and its individual units. These studies varied in focus from the general diversity and community structure to documentation of new species for the area.

Big Thicket region

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including plants. McLeod (1971; 1972) described the vegetation communities within the Big Thicket and separated the region into two groups, the upper and lower thicket, based on the presence or absence of American beech (*Fagus grandifolia*). Indicator species of specific habitats (e.g., bogs or xeric hillsides) were listed as well as common plants found in the thicket. Marks and Harcombe (1975) examined the high diversity of woody plants in the Big Thicket. The sites were in a variety of forests that varied in moisture and topography and were spread throughout the region of the preserve. Elevated within-habitat diversity was linked to the high diversity of shrubs while the between-habitat diversity was partially linked to a topographic-moisture gradient. Watson (1979a) described 10 vegetation types found in the Big Thicket and the ecological processes which occur in each type. Schafale and Harcombe (1983) described the vegetation of Hardin County as it would have existed prior to settlement of the area and found that pines were an important species in nearly all communities, while the beech-magnolia ‘climax’ forest was sparse.

Correll (1947) documented more than a dozen orchids existing in the Big Thicket area. Stoneburner and Wyatt (1979) documented three bryophytes in the Big Thicket area not previously found in Texas and 27 not previously found in those counties. The study was not specific to the park. Ajilvsgi (1979) described the wildflowers of Big Thicket, Texas and Louisiana.

Harcombe and Marks (1977) examined the understory structure of Wier Forest, a mesic forest located 16 km north of Beaumont. They found a high species diversity in the understory and attributed it to the high level of light that reaches the lower levels and tendency for differentiation of understory position between species. In a later report, Harcombe and Marks (1978a) described the correlation between dominant tree species and the replacement sapling species in BITH. Wetter habitats had less of the dominant species and a corresponding higher diversity of species in the sapling populations. Using 18 years of data from Wier Woods, Harcombe et al. (2002) examined whether competition or unpredictable factors determine stand dynamics. They found that the competition for light directed succession but that other factors also influenced the succession and would therefore limit the predictability for change.

Prosperie (1983) documented the life histories of 12 plant species found in the pine sandhill of the Roy E. Larsen Sandyland Sanctuary located between the four southeastern units of the park. Matos and Rudolph (1986) conducted a study of the vegetation in the Sandyland Sanctuary.

Harcombe and Van Kley (1996) described the regional variation that exists in the major community types of the West Gulf Coastal Plain. Possible causes include fire, weather, landforms, and soils. MacRoberts and MacRoberts (1996) described the rare species found in the West Gulf Coastal Plain and addressed the problems associated with documentation of these species.

Diggs et al. (2003) combined data from multiple sources to examine the species richness of vascular plants in the Big Thicket. They constructed an artificial boundary for the Big Thicket and compiled a list of 1,747 species from 173 families that have been documented in the area.

Big Thicket National Park

General plant community surveys, studies

A number of studies have examined the plant communities and vegetation types found in BITH. Harcombe and Marks (1975a, 1978b) defined and described the plant communities and vegetation types found in BITH. Forest types were classified into five main types with subcategories within; upland pine forest (pine sandhill, pine forests, pine savanna wetland), slope forest (upper slope pine oak, mid-slope oak pine, lower slope hardwood pine), floodplain forest (stream floodplain forest, river floodplain forest, cypress-tupelo swamp), flatland forest (flatland hardwood pine, flatland hardwood), and baygalls. They also gave descriptions of the vegetation in each unit. A study by students from Sam Houston State University (1975) examined the biological effects of creating BITH. They examined the vegetation, soil, and avian community. Harcombe and Marks (1979) described vegetation types in BITH and discussed environmental effects, such as soils, topography, southern bark beetle infestation, non-indigenous species, and succession on vegetation types. A LANDSTAT remote sensing study was conducted in BITH to gather information about vegetation types in the park (Cibula & Nyquist 1980; National Aeronautics and Space Administration 1977). They conducted ground truthing to verify data and compiled information on plant species and other collected data. Watson (1982b) summarized the vegetation types, plant species, and the ecological characteristics for each species such as habitat associations, soil type, fire tolerance, etc. for each of the BITH units. The site descriptions for this report were taken from the individual unit reports listed below under 'individual unit surveys and studies.' Watson (1982b) also listed the rare species detected in each unit of BITH, their status (endangered, threatened, etc.), general abundance within the park, and comments on the species or populations.

Additional studies have been conducted in the park that examines the different communities, regulating forces which maintain them, and catastrophic events which affect them. Streng (1979) and Streng and Harcombe (1982) conducted a study to examine the plant species, soil, tree growth and age, and landuse in four plant communities in BITH. They found that two contiguous savannas were maintained through different mechanisms, acidic soil with a shallow claypan and burning. Marks and Harcombe (1981) analyzed earlier data on the vegetation types of Big Thicket. Variation between stands was partially explained by differences in soil moisture. They discussed the lack of a common climax type because the land varies in moisture content which has lead to different environments and climax stages. The 13 vegetation types were described and dominant species listed. Through the use of historical aerial photographs, a history of the *Sarracenia* bogs was developed and recommendations were made to use prescribed burns to maintain the bogs (Big Thicket National Preserve n.d.-a). Glitzenstein and Harcombe (1988) examined the effects a 1983 tornado had on species presence, loss of canopy, and future forest structure at Hickory Creek and Turkey Creek Units at BITH. Forest composition was altered, in the short-term, due to the high mortality of trees of the larger size classes. Coulson et al. (1996) examined how bark beetles affected forest structure and the rate of change at a landscape level.

Vegetation data has been collect in portions of BITH and the Big Thicket area to examine the effects of climate change on forest composition and structure. Hall et al. (1994) conducted a study to examine the effects of long-term climate change on Gulf Coast forests. Sapling and tree growth, soil moisture and temperature, and general weather and climate data were collected on study sites in the area. Cook et al. (1996) conducted a study on the use of tree rings to examine how long-term variations in moisture affect different tree species and consequently how Big Thicket forests will respond to climate change. Winters and Harcombe (1996) used tree rings to examine the assumption that seasonal growth patterns can be depicted by a smooth curve. Using data from BITH they examined over 20 species along a moisture gradient and found extreme variation involving site, species, and time of year. In a later paper, Glitzenstein et al. (1999) analyzed tree ring data using two different transformations. They found that forest disturbance, both natural and anthropogenic, may vary across moisture and topographic gradients in a predictable manner. Harcombe (1997) described multiple studies conducted at BITH that examined effects of climate change on the forest ecosystem. Topics included effects of flooding and fire, storm disturbances, and influence of climatic fluctuations. Harcombe et al. (1999) used long-term data collected in three areas of BITH to examine the possible effects of global climate change on forests. Beginning in 1980, data were collected on the abundance, mortality, basal area, and growth of the trees and samplings. They used this data to examine changes in abundance and basal area and determine possible causes. They also examined whether climate could be a factor in any variations in growth. Harcombe (1999) discussed forest dynamics at these three sites over a 20-year period. He found that most of the changes that occurred were due to anthropogenic disturbances but there were also unpredictable disturbances as well. Climate change will likely have a greater indirect effect on forests through more frequent or intense disturbances.

Strahan et al. (1996) summarized baseline information on the biological resources of the park. They outlined the current knowledge of the vegetation and discussed the major research that has been conducted in the park. Wolfe et al. (1999) delineated and classified the natural communities of Big Sandy, Hickory Creek Savanna, Turkey Creek, and Lance Rosier Units using cooler infrared aerial photographs, review of literature, and experts, as well as ground-truthing. The draft oil and gas management plan described the vegetation found in the major habitat communities within the park (Author unknown 2000).

General vegetation surveys

Schedlbauer et al. (1974) reported on preliminary findings of a botanical survey of the non-flowering plants in BITH. Each of the four sections covered different taxa, including ferns, algae, bryophytes, and lichens. The diversity of taxa in the individual units was discussed and suggestions were given for trails that would highlight a particular group of non-flowering plants. Watson described the rare and/or endangered plants found or possibly found in BITH (National Park Service 1981). Malnassy (1978) conducted a baseline survey of winter plants from October to December 1976. He collected and documented 52 winter forms of plants at BITH and organized them by unit. A list of wildflowers and bloom times for BITH also was created.

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians. They documented 20 species of plants listed as endangered, threatened, rare, or of concern in the counties in which the park units exist (Table 1). Half of these species are considered facultative residents of bottomland hardwood forests (can live in bottomland forests but are not restricted to this habitat) and two species, Texas screwstem and Texas trillium, are obligates of the bottomland hardwood forests (restricted to this habitat). The existence and status of the species on this list have been updated and are included in Appendix A.

Brown and Brown (1996) examined three herbarium collections (over 2000 specimens) and compared the list with Watson's checklist of vascular plants for BITH. They only found a voucher specimen for about 47% of Watson's list and found 72 vouchers for specimens not on the original checklist.

MacRoberts and MacRoberts (2003) conducted an in-depth review of the botanical resources of Big Thicket with a particular focus on BITH. They found the area lacked appropriate documentation and made recommendations for future areas of study. Harcombe et al. (2003b) discussed the status of the voucher specimen collection of all vascular plants in BITH. They have amassed specimens from over 1100 species, which is three-quarters of the species that are thought to exist in the park.

Table 1. Rare plant species of BITH as they were listed in Harcombe and Callaway (1997a).

Name	**Scientific Name**	**Federal [a]**	**State**
Navasota ladies'-tresses	*Spiranthes parksii*	Endangered	Endangered
Texas trailing phlox	*Phlox nivalis var. texensis*	Endangered	Endangered
bog coneflower	*Rudbeckia scabrifolia*	SC	Imperiled
Drummond's yellow-eyed grass	*Xyris drummondii*	SC	Imperiled
harvest lice	*Agrimonia incisa*	SC	Critically Imperiled
long-sepaled false dragonhead	*Physostegia longisepala*	SC	Imperiled
rattlesnake root	*Prenanthes barbata*	SC	Imperiled
rough-leaf yellow-eyed grass	*Xyris scabrifolia*	SC	Imperiled
scarlet catchfly	*Silene subciliata*	SC	Rare
slender gay feather	*Liatrus tenuis*	SC	Rare
southern lady's slipper	*Cypripedium kentuckiense*	SC	Critically Imperiled
white firewheel	*Gaillardia aestevalis* var. *winkleri*	SC	Critically Imperiled
bog buttons	*Lachnocaulon digynum*	3C	Critically Imperiled
lady cress	*Armoracia lacustris*	3C	Critically Imperiled
Mohlenbrock's umbrella sedge	*Cyperus grayoides*	3C	Rare
small-headed pipewort	*Eriocaulon kornickianum*	3C	Critically Imperiled
smooth blue-star	*Amsonia glabberima*	3C	Imperiled
Texas (least) trillium	*Trillium pusillum* var. *texanum*	3C	Rare
Texas screwstem	*Bartonia texana*	3C	Imperiled
three-leaf cowbane	*Oxypolis ternata*	3C	Critically Imperiled

[a] Federal Status Codes: SC, Species of Concern; 3C, species no longer being considered for federal listing (formally Category 3 species)

Species surveys, studies

Pines

A park document discussed the status of slash pine (*Pinus elliottii*) plantations within the park and examined possible control methods and the corresponding positive and negative effects (Big Thicket National Preserve 1978). Fleming and McHugh (1979b) examined the status of slash pine plantations in BITH and discussed methods of removing this non-indigenous tree species. Descriptions and locations of plantations in each unit were included.

Evans (1996) studied the longleaf pine (*Pinus palustris*) range in Eastern Texas. He documented the existence of longleaf pine in 14 out of the original 15 counties plus an additional 6 counties. Although the range has expanded, it faces extirpation throughout much of the range.

Bryophytes

Bazan (1980) conducted a study of the ecology and distribution of the Hepaticae species found in the Turkey Creek Unit. She found that plants varied based on a moisture gradient, as well as height, exposure, and bark characteristics. Wyatt et al. (1980) conducted surveys for *Sphagnum* sp. in the Big Thicket area and found eight of the nine species known to occur in Texas plus two new species for Texas.

Bromeliads

Benzing (1989) conducted a study of the status and chemical composition of Spanish moss (*Tillandsia usneoides*). A population decline was detected and chemical analysis of the sample reveled elevated levels of some metals, especially near industrial sites.

Fungi

Cibula (1978) conducted a study during 1977 and 1978 to examine the fungi in the Turkey Creek Unit He documented 56 species and recorded their abundance, edibility, and community association. He also described collections made by the Houston Mycological Society from Lance Rosier and Turkey Creek Units during November of the first year. Cibula (1979) examined the seasonal occurrence and abundance of fungi found in the Jack Gore Baygall and Turkey Creek Units and documented the edibility, community association, and substrate.

Lewis (1978) conducted a study of the Agaricales of Southeast Texas and found 86 species and varieties in the Beaumont, Lance Rosier, and Big Sandy Creek Units. Lewis and McGraw (1981) conducted a study to determine species richness of *Amanita* sp. (Order: Agaricales) in the Big Thicket and focused mostly in Beaumont, Lance Rosier, and Big Sandy Creek Units and surrounding areas. They found *Amanita* to be an important part of the mushroom communities in BITH and documented 23 species and varieties of the genus, 13 of which had not previously been documented in Texas. They also found one sample of a genus, *Limacella*, which had not previously been documented in Texas. In a continuation of the 1981 study, Lewis and McGraw (1982, 1984) generally discussed the Agaricales, which inhabit BITH and the surrounding area. They included a list of 75 species, 30 of which were reported for the first time in Texas, which had been documented in the five-year study. Blackwell and Gilbertson (1982) proposed to conduct a study that would focus on the wood-rotting Basidiomycetes within BITH. A list of species that had already been detected in the park was included in the documents. An undated map details the locations of two rare species of mushroom, *Hygrophorus cantharellus* and *Lactarius petersenii,* in the preserve.

The Texas Mycological Society (1981, 1982, 1983a, 1983b, 1986, 1988, 1991, 1992) developed lists of fungi collected on surveys conducted in BITH during select years. Lewis (1982c) summarized the species detected in BITH from 1978 through 1981 and discussed new species that had been added. Species were listed by unit (for Lance Rosier, Beaumont, Big Sandy, Turkey Creek, Jack Gore, and Menard Creek) for each year and descriptions were given for each species. Lewis (1982a&b) documented the species collected in BITH during the summer of 1982 as well as for the whole year. Lewis (1983) described the species found during 1983. Willingham (1993) compiled a list of species collected in BITH during 1993 as well as a compilation list for collection taken from 1977 to 1993. Lewis and Cibula (1999) discussed their ongoing research on the species diversity of the Gulf Coastal Plain, including collection sites in BITH. Lewis and Cibula (2000) described additional findings of Agaric species found on the Gulf Coast Plain in the Big Thicket and Harrison Experimental Forest.

Lewis and Parigi (1996) collected mushroom fruiting bodies from the Forest Lake Experimental Forest near the Beech Creek Unit and outside of Evadale, near the Lower Neches River Corridor Unit and examined them for heavy metal pollution.

Lewis (1996) conducted a study in the Forest Lake Experimental Forest near the Beech Creek and Upper Neches River Corridor Units on the ectomycorrhizal fungi associated with oaks. He found that over 90% of the mushrooms were from 6 families and there was a greater species diversity associated with white (*Quercus alba*) and water oaks (*Quercus nigra*). Lewis (2003) described the seasonal occurrence of fungi using 25 years of data from the Gulf Coast and Big Thicket region.

Lichens

Troxell (1977) conducted a survey of lichen in five representative plant communities within the general area of the BITH. She documented 114 species of lichen and discussed their occurrence and vegetation types where they were located. Egan (1979) discussed the ecology and identification of lichens and provided a checklist for the park and surrounding area. Egan (1980) updated the list of species documented during previous research at the Hickory Creek Savannah and Turkey Creek Units. Egan created a compilation list and slide set of 69 species of lichens that exist in BITH. The 30 species from Hickory Creek were the first lichens documented in that unit.

Egan and Gordy (1981) conducted a study to examine the effects of sulfur dioxide on epiphytic lichens in BITH. Permanent study sites were established and examined for lichens. Surveys recorded species abundance and diversity, host species and abundance, percent cover, and examined the specificity for a particular substrate. Air quality modeling indicated that sulfur dioxide levels were below the damage threshold. Gordy (1986) reexamined the permanent sites to determine if any changes in distribution had occurred. Although changes in abundance were detected for various species, air quality was not considered to be the causal mechanism.

Pitcher Plants

Oard et al. (1996) examined the geologic evolution of pitcher plants, *Sarracenia* sp, and pitcher plant moths, *Exyra* sp., to determine the reason for such high species diversity in the pinelands. Grace (1999) examined the environmental ecology, including hydrology, elevation, soils, and vegetation, of pitcher plant communities. Two of the study sites occurred in BITH. Mize et al. (2003) conducted a restoration project on a pitcher plant bog in Angelina National Forest that had been seriously impacted by off-road vehicles. They described the success of the project and the environmental impacts that affect the pitcher plant community.

Other

Watson (1976a) described which species of orchids could still be found in BITH as well as their habitat types and bloom times. Liggio (1996) compiled a species list of the Orchidaceae in the Big Thicket and Longleaf Pine region.

Whitefield et al. (1996) described the reintroduction of Texas trailing phlox (*Phlox nivalis texensis*) to BITH.

Individual Unit Surveys and Studies

Beaumont Unit

Watson (1979b) described the vegetation, plant species, and relative abundance found in the Beaumont Unit. Lewis (1978) conducted a study of the Agaricales of Southeast Texas and found 86 species and varieties in the Beaumont, Lance Rosier, and Big Sandy Creek Units. Lewis and McGraw (1981) conducted a study to determine species richness of *Amanita* sp. (Order: Agaricales) in the Big Thicket and focused mostly in Beaumont, Lance Rosier, and Big Sandy Creek Units and surrounding areas.

Blanton & Associates completed vegetation mapping and sampling in three of the BITH units, Beaumont, Jack Gore Baygall/Neches Bottom, and the eastern half of Lance Rosier (Hutter 2001). Approximately 1,000 species were documented through voucher specimens during 1998 through 2000. Qualitative descriptions were also recorded for topographic position, landform, hydrology, soil, and drainage. In a documentation summary for this project, Blanton & Associates (n.d.) summarized the vegetation descriptions and surveys that were conducted in the area and in the park.

Big Sandy Creek and Menard Creek Units

Harcombe and Marks (1978b) described the vegetation types and specific plant species associated with each type found in Big Sandy Creek Unit and Beech Creek Unit. Watson (1978b) conducted a survey of the vegetation in Big Sandy Creek Unit. A description of the vegetation with geological and anthropological effects on the vegetation was presented. A checklist of species in the unit was created along with habitat and flowering information. Lewis (1978) conducted a study of the Agaricales of Southeast Texas and found 86 species and varieties in the Beaumont, Lance Rosier, and Big Sandy Creek Units. Lewis and McGraw (1981) conducted a study to determine species richness of *Amanita* sp. (Order: Agaricales) in the Big Thicket and focused mostly in the Big Sandy Creek, Beaumont, and Lance Rosier Units and surrounding areas. Harcombe and Schafale (1981) surveyed the fuel load in Big Sandy Unit. They found a lower flammability level at Big Sandy compared with the other units due to an absence of highly flammable communities. If fires did start in Big Sandy they would likely be cool and slow spreading. In addition, they also developed a long species list of plants in the unit. A vegetation assessment was conducted in the Big Sandy Creek Unit prior to oil operations (PBS&J 2003). The vegetation in the area was mapped, alliances were identified, and vegetation was sampled. Based on these surveys, they found 10 vegetation alliances.

Watson (1981, 1982a) conducted a study of the plant species of the Menard Creek Corridor Unit. As with the vegetation studies conducted in other units, it contained a list of documented species, the habitat in which they are found, and their relative abundance. Additionally, the geology of the unit was discussed as was the vegetation types found in the unit. Watson described eight vegetation types (prairie, sandy uplands, beech-magnolia-loblolly pine, acid bog-baygall, lower floodplain, upper floodplain terrace, sandbar, and aquatic) that exist in the Menard Creek Corridor Unit and plant species and relative abundance associated with each type.

Loblolly Unit

Watson (1977c) examined the plant species which are found on the Loblolly Unit of BITH. The species were grouped both by family and growth form, with their density and habitat was detailed. She considered the list incomplete because not all species were flowering or fruiting during the survey. Watson also discussed the vegetation changes that occurred during a pine beetle outbreak and addressed what the possible long-term effects will be on the habitat.

Beech Creek Unit

Watson (1977a) also created a list of species documented in the Beech Creek Unit. She again considered the list incomplete because not all species were flowering or fruiting during the survey. Harcombe and Marks (1978b) described the vegetation types and specific plant species associated with each type found in the Beech Creek and Big Sandy Creek Units. Wilson (1978) discussed the previous land-uses of the Beech Creek Unit and the history of the vegetation, including fire history and outbreaks of southern pine beetle.

Hickory Creek Unit

Watson (1977b) examined the plant species found in the Hickory Creek Savannah Unit of BITH. The species were grouped both by family and growth form, with their density and habitat was detailed. A list of possible species was also included but was considered incomplete because not all species were flowering or fruiting during the survey. Watson also discussed the vegetation changes that have occurred due to human disturbance and fire suppression. Streng and Harcombe (1978) conducted a transect survey of the existing fuel load of the four plant communities on Hickory Creek Savannah Unit. They discussed the fuel type and moisture content and found that it varied by community. They felt that the flammability of an area was better indicated by the fuel beds structure than its loading. Egan (1980) conducted a study to document the lichen species found in the Hickory Creek Savannah and Turkey Creek Units. The 30 species from Hickory Creek were the first lichens documented on that unit.

Turkey Creek Unit

Watson (1974) conducted a survey of the Kirby Primitive area and found 240 species of plants. Watson (1978a) also surveyed the vegetation of Turkey Creek Unit. She documented species, described the soil and vegetation of the unit, and also made management recommendations. Cibula (1978, n.d.) conducted a study during 1977 and 1978 to examine the fungi on Turkey Creek Unit He listed the species found, abundance, their edibility, and community association. In a later report, Cibula (1979) examined the seasonal occurrence and abundance of the fungi found in the Turkey Creek and Jack Gore Baygall Units and documented the edibility, community association, and substrate. Streng and Harcombe (1979) conducted a survey for a fuel load study within the Turkey Creek Unit during the summer of 1978. Line transects were used to determine tree species and age, density, fuel load, and flammability that were compared between community types. In addition, they also developed a short species list of plants in the unit. Fleming and McHugh (1979a) proposed a management plan for *Sarracenia* bogs in the Turkey Creek Unit in which they recommended removing trees and implementing prescribed burns. Egan (1980) conducted a study to document the lichen species found on Turkey Creek and Hickory Creek Savannah Units. Survey efforts have been greatest on Turkey Creek than other units in the park.

Bazan (1980) conducted a study of the ecology and distribution of the Hepaticae species found in Turkey Creek Unit. She found that plants varied based on a moisture gradient, as well as the height, exposure, and bark characteristics. Texas trailing phlox (*Phlox nivalis texensis*), a federally endangered species, was reintroduced into the sandhill pine area of Turkey Creek Unit. The 1995 management plan for its reintroduction discussed methods for monitoring populations and management of the sandhill pine area (Big Thicket National Preserve 1995). Kaiser and Harcombe (1996) used models to examine the future of longleaf pine in a mixed pine-oak stand within the Turkey Creek Unit. They found that the longevity of individual trees allowed the population to continue even in the face of unfavorable conditions. Fulton (1996) examined the spatial pattern of tree stems along a topographical moisture gradient on three sites in BITH and within the area between the BITH units. Sites included Turkey Creek, Wier Woods, and Neches Bottom. Glitzenstein et al. (1996) monitored the species composition of a fire-suppressed upland forest in the Turkey Creek Unit for 16 years. They found that the saplings of the canopy species were being replaced by species of a more mesic habitat and suggested that continued fire suppression will cause the current community to be replaced by mesic hardwoods.

Jack Gore Baygall-Neches Bottom, and Upper and Lower Neches Corridor Units

Watson (1979b) described the vegetation, plant species, and relative abundance found in the Jack Gore Baygall-Neches Bottom Unit, Upper and Lower Corridor Units, as well as the Beaumont Unit. She documented the species and described the vegetation zones in which they were found. Mohler (1979) conducted a study of the floodplain vegetation of the Lower Neches. Information was gathered on the species diversity and density as well as the influence of soil moisture and flooding. Woods (1979) examined streambed vegetation as it varied along an elevational-moisture gradient within the Upper and Lower Neches, mid-Corridor, and Jack Gore Baygall and Neches Bottom Units. He documented species and their location along the streambed. Cibula (1979) examined the seasonal occurrence and abundance of the fungi found on Jack Gore Baygall Unit and Turkey Creek Unit and documented the edibility, community association, and substrate. Ortego (1984) described the vegetation types of the Lower Neches as well as landuses and their effects on the wildlife of the area. The report also commented on the status of common animal species as well as endangered or protected species that occurred or should occur within the unit.

Blanton & Associates completed vegetation mapping and sampling on three of the BITH units, Beaumont, Jack Gore Baygall/Neches Bottom, and the eastern half of Lance Rosier. Approximately 1,000 species were documented through voucher specimens during 1998 through 2000 (Hutter 2001). Qualitative descriptions were also recorded for topographic position, landform, hydrology, soil, and drainage. In a documentation summary for this project, Blanton

& Associates (n.d.) summarized the vegetation descriptions and surveys which have been conducted in the area and in the park.

A number of studies have been conducted on changes in hydrology due to dams and the resulting effects on the ecology in the Neches River Basin. Hall and Harcombe (1987) compared tree rings from the Upper Neches above and below the Sam Rayburn Dam to examine the effect of flooding on growth and found no difference between the sites. Hall (1993b) examined the effect of flooding and canopy gaps on growth and recruitment of saplings in the Neches River Basin. Hall (1993a) analyzed data from Neches Bottom to determine the impact of the Town Bluff dam on the river basin. The flooding cycle was altered and a number of expected alterations to the river and habitat were discussed, including channel morphology, sedimentation, water quality, submerged habitats, meandering, and vegetation. Hall and Harcombe (1998) conducted a study to examine how light availability and flooding affected the spatial pattern of sapling establishment from 1980 to 1990. Although saplings responded to both light and flooding, the interaction of the two sometimes caused flood tolerant species to grow in lower light conditions than usual and flood intolerant species to grow in higher light conditions than usual. Using 15 years of data from the Neches Bottom-Jack Gore Baygall Unit, Hall and Harcombe (2001) examined yearly variation in sapling recruitment and mortality. Yearly variation was high but recruitment rates generally fluctuated less then death rates. Sapling mortality was related to flooding patterns while recruitment was related to drought and soil moisture availability.

Lance Rosier Unit and Pine Island Bayou-Little Pine Island Bayou Corridor Unit

Lewis (1978) conducted a study of the Agaricales of Southeast Texas and found 86 species and varieties in the Lance Rosier, Beaumont, and Big Sandy Creek Units. Lewis and McGraw (1981) conducted a study to determine species richness of *Amanita* species (order: Agaricales) in the Big Thicket and again focused mostly in these same units and surrounding areas. The Texas Mycological Society (1983a) conducted a survey of the fungi in the Lance Rosier Unit.

Watson (1980a&b) conducted a study of the general vegetation in the Lance Rosier and Pine Island Bayou and Little Pine Island Bayou Corridor Units. A general description of the vegetation, topography, and anthropogenic disturbances was given as well as a list of species found and their abundance and habitat associations in the unit. Glitzenstein and Harcombe (1980) conducted an inventory of fuel load and the corresponding flammability of each vegetation type in the Lance Rosier Unit. They concluded that fire danger in the park was low and in the event of a fire, damage to large woody plants would be minimal. In addition, they also developed a long species list of plants in the unit.

Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. He listed seven habitat associations that exist within the watershed and gave a detailed description for five of them. According to this report, approximately 900 species of plants had been documented in the watershed, including three species whose only records within Texas were this watershed.

In an environmental assessment of a proposed seismic survey in the Lance Rosier Unit, Blanton & Associates, Inc (1999) listed 20 exotic or opportunistic plant species or genera which occurred or could have occurred. Blanton & Associates completed vegetation mapping and sampling on three of the BITH units, Beaumont, Jack Gore Baygall/Neches Bottom, and the eastern half of Lance Rosier. Approximately 1,000 species were documented through voucher specimens during 1998 through 2000 (Hutter 2001). Qualitative descriptions were also recorded for topographic position, landform, hydrology, soil, and drainage. In a documentation summary for this project, Blanton & Associates (n.d.) summarized the vegetation descriptions and surveys which have been conducted in the area and in the park.

Experts: Geraldine Watson, Geyata Ajilvsgi, MacRoberts and MacRoberts, Larry Brown and Paul Harcombe (vascular plants), David Lewis (fungi), Robert Egan (lichen), Stanley Jones (sedges), Joe Liggio (orchids).

MAMMALS

A number of studies have been conducted on the mammal populations at BITH. However, much of this information has focused on the game species, much of which is at least 20 years old. Fewer studies have been conducted on non-game species. Some of these studies were conducted over large areas with portions of the project conducted in BITH.

Summary reports

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including mammals. They described the list of possible mammal species as incomplete and especially lacking in small mammals such as mice and shrews.

Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. Species lists for fauna included 68 species of mammals. Species of importance were listed based on status (rare or peripheral) and use (game species).

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians. They documented five mammals listed as endangered, threatened, rare or of concern in the counties in which the park units exist (Table 2). The existence and status of the species on this list have been updated and are included in Appendix A. One of these species, the red wolf, is now thought to be extinct. Of the five species southeastern myotis bat is an obligate of the bottomland habitat while the other four are facultative users.

Strahan et al. (1996) summarized the baseline information on the biological resources at the park. They outlined the current knowledge of the mammal species that have been documented and discussed the major surveys that have been conducted on the park. Current projects were also described. Sixty mammal species have been documented or are thought to exist within BITH, including three federally and/or state listed species (Appendix A; Author unknown 2000).

Table 2. Rare mammal species of BITH as they were listed in Harcombe and Callaway (1997a).

Name	Scientific Name	Federal	State
red wolf	*Canis rufus*	Extirpated	Extirpated
Louisiana black bear	*Ursus americanus luteolus*	Threatened	Endangered
Big Thicket hog-nosed skunk	*Conepatus mesoleucus telmalestes*	Candidate for listing	Critically Imperiled
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Threatened
Southeastern myotis bat	*Myotis austroriparius*	SC	Threatened

General surveys, studies

Schmidly et al. (1977) discuss the native and exotic mammal and bird species found in East Texas, and noted which species were found in BITH. Schmidly and Rogers (1978) conducted a study of the mammals on Beech Creek and Big Sandy Units of BITH. They sampled species using a variety of methods including trapping, bat netting, drag-line counts, time area counts, and sampling of museum collections. Schmidly et al. (1979) discussed the presence, richness, distribution, and status of mammal species of BITH and East Texas and documented 62 game and non-game species within the park. Schmidly (1999) in discussing the findings of his earlier research found that 52 mammal species have at some point occupied the BITH; 8 of those species have been extirpated from the area.

Game species surveys, studies

Spencer (1976a&b) documented the increase in disease and malnutrition of deer caused by increased populations in eastern Polk, western Tyler, and southern Hardin Counties and recommended hunting of both male and females. However, Schmidly and Rogers (1977) conducted a census of mammalian game species (squirrels and deer) in Beech Creek and Big Sandy Units. They found similar densities of squirrels to those of other regions but found deer populations were low. They recommended a limit on deer hunting in these units. BITH (1980) conducted a survey of squirrel and deer hunters using the Beech Creek Unit during the 1979-1980 hunting season.

Schmidly et al. (1980) and Fagre et al. (1989) described the results of a study that correlated the abundance of game and furbearing mammals with the existing plant communities for each unit. Results were broken up into sections based on species groupings and covered squirrels, deer and furbearing mammals, aquatic mammals, and feral hogs as well as a survey of trappers. Small mammal data were also collected on a few of the units. No master list was created for all species detected.

Stapper (1989) and Stapper et al. (1989) conducted a study to examine the species diversity and richness of furbearer populations in BITH. They also compared the used of scent-station surveys and track counts to determine furbearer populations in BITH. In the late 1980's, Fagree al. (1989) conducted studies to examine the population status of big game, selected small game, and furbearing mammals in five national parks including BITH. A report by BITH was written in the

1990's describing the need for research to examine the effect of feral hogs on the preserve (Big Thicket National Preserve n.d.-b).

Non-game species surveys, studies

Carley (1979) discussed the status and range of the red wolf which included BITH. Switzer (1989) reviewed the extirpation of black bears (*Ursus americanus*) in BITH and recent (as of 1989) sightings within the park. Garner (1996a&b) conducted a habitat suitability study for black bears in East Texas and included sites in BITH. The study examined the availability of habitat for a viable black bear population with minimum bear/human conflict.

Mirowski and Horner (in Zipp 2001) conducted a study examining the roosting ecology of the southeastern myotis (*Myotis austroriparius*) and Rafinesque's big-ear bat (*Plecotus rafinesquii*). Mirowski et al. (1996) described this study which examined current distributions, correlated vegetative communities with habitat use and studied parameters of roost sites.

Experts: David Schmidly and Duke Rogers, East Texas Black Bear Working Group (Nathan Garner)

HERPETOFAUNA

There is very little documented information on the herpetofauna of BITH. One general survey was conducted in the park almost 30 years ago and several small studies provided detailed information on individual species. There have been no recent surveys conducted, aside from a survey of Big Sandy Creek Unit.

Summary reports

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including reptiles and amphibians. They developed a list of herpetofauna based on a checklist of North American species and observations from the area. It was likely that this list overlooked some species and contained other species that did not actually exist within the park.

Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. Species lists for fauna included 80 reptile and amphibian species. The climate and abundance of permanent water sources has provided excellent habitat for herpetofauna and created a diverse population.

Strahan et al. (1996) summarized the baseline information on the biological resources at the park. They outlined the current knowledge of the herpetofaunal species that have been documented and discussed the major surveys that have been conducted in the park.

According to the draft oil and gas management plan (2000), approximately one-third of the herpetofaunal species existing in Texas, or 85 species, could exist within the BITH. Snakes represent the most diverse group with over one-half of the Texas species inhabiting the park. Six federally and/or state listed species are thought to exist within BITH (Appendix A).

General surveys, studies

Rainwater (1974) summarized the available information on the herpetofauna existing in Hardin, Polk, Jasper, and Tyler Counties. Seventy-six species were documented in the four counties. While he found that there were no endemic species, there were two endangered species, *Alligator mississippiensis* and *Bufo houstonensis*, known to occur in the area. Fisher and Rainwater (1978) conducted surveys of the forest communities of BITH for amphibians and reptiles during late spring and early summer of 1975 and spring of 1976. They conducted terrestrial searches on foot and by car and aquatic searches by canoe and created a checklist of 54 species of herpetofauna of the park. Witt (1985) documented reptile and amphibian observations on Big Sandy and Loblolly Units in February 1985. Lewis et al. (1999, 2000) conducted a study of the herpetofauna in four forest types in the Big Sandy Creek Unit. They documented 40 species and recorded over 1800 individuals. Species diversity varied with the forest type and was influenced by moisture availability. The two lower elevation mesic forest types had a greater abundance of amphibians and snakes.

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians. He documented five species of reptiles listed as endangered, threatened, rare, or of concern in the counties in which the park units exist (Table 3). The existence and status of the species on this list have been updated and are included in Appendix A. The floodplain forests provide habitat for timber rattlesnake, alligator snapping turtle, and Texas diamondback terrapin.

Table 3. Rare herpetofauna species of BITH as they were listed in Harcombe and Callaway (1997a).

Name	**Scientific Name**	**Federal**	**State**
Louisiana pine snake	*Pituophis ruthveni*	Species of Concern	Endangered
alligator snapping turtle	*Macrochelys temmincki*	Species of Concern	Threatened
timber (canebrake) rattlesnake	*Crotalus horridus*		Threatened
Texas diamondback terrapin	*Malaclemys terrapin littoralis*	Species of Concern	Rare
Texas horned lizard	*Phrynosoma cornutum*	No longer being considered for listing	Threatened

Ford (1996) studied the effect of logging practices on the herpetofauna in East Texas. Although previous research found evidence that in general any effects would be short lived, they questioned whether effects on those species associated with older growth forest may be more heavily impacted. Irwin and Dixon (1996) examined the effect of timber harvesting on the reptiles and amphibians of the Neches River bottomland hardwood forest. Preliminary data suggested that those amphibian species most affected by clearcutting may benefit from streamside management zones although multiple factors (e.g., frequency of harvest, pattern, and extent) ultimately affect the conservation of the herpetofaunal community.

Species surveys, studies

Two species studies have been conducted on reptiles within the park. Kennedy (1956) documented an arboreal nest of the five-lined skink (*Eumeces fasciatus*). In an investigative study of the eastern fence lizard, *Sceloporus undulatus*, Kennedy (1964) also documented eleven snake species at BITH. Descriptions of food habits, distribution, and information regarding young are included for the snake species. Kennedy (1975) described the reptiles found in BITH for general public publication.

A couple of additional studies examined reptiles in the greater Big Thicket/East Texas area. Rudolph et al. (1999) examined the effect of roads and vehicles on snake populations in the Big Thicket area. Their data suggested that roads and traffic negatively effect snake populations in the area. Rudolph et al. (2003) discussed findings of arboreal behavior in the timber rattlesnake (*Crotalus horridus*). They found an increased rate of arboreal behavior with individuals occurring higher than previously documented. Collins et al. (1999) studied the distribution and abundance of alligator snapping turtles (*Macroclemys temminickii*) in Eastern Texas. Fitzgerald et al. (2003) also discussed alligator snapping turtle distribution across the state and examined the microhabitats they selected. They found the turtles chose more structurally complex sites and that larger turtles also chose warmer sites than would be selected at random.

There have been no studies on individual species of amphibians in the park.

Experts: Joseph Patrick Kennedy (reptiles), Fred Rainwater, Lee Fitzgerald (reptiles)

BIRDS

Multiple surveys have been conducted in the park although many date back to the late 1970's and early 1980's. Several volunteer-based surveys that occur in or near the park are conducted yearly with some beginning as early as the late 1960's. Aside from these surveys, there have been no organized monitoring programs to examine the avifauna of BITH.

Summary reports

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including birds. They described the Big Thicket as the 'greatest value to bird life in the state and that in it are found colonies of birds either thought to be extinct or to be of very rare occurrence.' One notable species present on the list, Ivory-billed Woodpecker (*Campephilus principalis*), is currently thought to be extinct although there have been possible sightings in the recent past.

Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. Species lists for fauna include 296 species of birds. Over one hundred of the bird species are known to nest in the area.

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles, and amphibians. They documented 12 bird species listed as endangered, threatened, rare or of concern in the counties in which the park units exist (Table 4). The existence and status of the species on this list have been updated and are included in Appendix A. Three of these species they listed, Bald Eagle, American Swallow-tailed Kite, and Wood Stork, are considered facultative residents of bottomland hardwood forests. Two species, Ivory-billed Woodpecker and Bachman's Warbler were obligates of bottomland hardwood forests but are both now believed to be extinct.

Table 4. Rare bird species of BITH as they were listed in Harcombe and Callaway (1997a).

Name	**Scientific Name**	**Federal**	**State**
Wood Stork	*Mycteria americana*		Threatened
Brown Pelican	*Pelecanus occidentalis*	Endangered	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Threatened
Eskimo Curlew	*Numenius borealis*	Endangered	Endangered
Ivory-billed Woodpecker	*Campephilus principalis*	Extirpated	Extirpated
Red-cockaded Woodpecker	*Picoides borealis*	Endangered	Endangered
Bachman's Warbler	*Vermivora bachmanii*	Extirpated	Extirpated
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Similar appearance to a Threatened Species	Threatened
White-faced Ibis	*Plegadis chihi*	3C	Threatened
Bachman's Sparrow	*Aimophila aestivalis*	Species of Concern	Threatened
American Swallow-tailed Kite	*Elanoides forficatus*	3C	Threatened
Interior Least Tern	*Sterna antillarum athalassos*	Endangered	Endangered

Strahan et al. (1996) summarized the baseline information on the biological resources of the park. They outlined the current knowledge of the bird species that have been documented and discussed the major surveys that have been conducted in the park. Current projects were also described.

As of 2000, no comprehensive survey of the avifauna had been conducted in the park (Author unknown 2000). Despite the lack of any organized monitoring effort, they found 176 species have been documented, including 10 federally and/or state listed species (Appendix A). Additionally, BITH is listed as one of The American Bird Conservancy's Important Bird Areas (Chipley et al. 2003).

General surveys, studies

Fisher (1974) conducted a preliminary survey of the birds in BITH as a part of a larger faunal survey that also included invertebrate and herpetological surveys. He documented 290 species within the park. A study by students from Sam Houston State University (1975) examined the biological effects of creating BITH. They examined the vegetation, soil, and avian community. Bryan et al. (1976) examined the distribution of breeding birds, densities, habitat, and the community structure in the BITH. One hundred and nine species were detected. Biercevicz

(1977) composed a list of 154 bird species detected during spring, summer, and fall surveys on various units in BITH and the surrounding area. Deuel and Fisher (1977) and Deuel (1977) conducted a study of the forest avifauna found in BITH. They conducted transect surveys by foot and canoe during spring of 1976 to determine species richness and abundance of four forest communities. Schmidly et al. (1977) discussed the native and exotic mammal and bird species found in East Texas, and noted which species were found in BITH. Mackinnon (1986) developed a list of 188 bird species and their local abundance in and around BITH during 1986 and noted the number of occurrences of unusual species.

Conner (1996) examined the relationship between forest age, structure and composition, and the bird communities in the West Gulf Coastal Plain. Preliminary data suggested that area-sensitive species were affected by patch size, landscape use patterns, and forest fragmentation.
Barrow et al. (1999) examined the effect of the increasingly abundant Chinese tallow (*Sapium sebiferum*) on migrating landbirds. They found that at least 63 migratory birds used the forested areas of the West Gulf Coastal Plain before and after crossing the Gulf of Mexico. In forests with tallow, this species was used significantly less than expected.

Individual unit surveys

Ramsey (1980) conducted surveys of the birds in the Beaumont Unit of BITH from October 1975 through June 1976. Through fall, winter, and spring surveys, he documented 58 species from 26 families. Williams (1981) conducted a study of the seasonal occurrence of birds in the Dujay Sanctuary which adjoins the Lance Rosier Unit. Two of the 78 species that he documented and described had not been previously detected in the area during the winter. MacKinnon (1983) conducted a survey of birds in the Beech Creek Unit but the information was not summarized into a report. McGuffin (1984) conducted line transect surveys in the Loblolly Unit to examine the community structure of the forest bird community during 1983. Sixty-two bird species were documented. Data were analyzed to determine species abundance, diversity, absolute density, detectability, and dominance.

The Breeding Bird Survey, a long-term monitoring program designed to monitor the status and trends of avian populations in North America, had a route that cut along the north end of the Hickory Unit and through the middle of the Turkey Creek Unit (U.S. Geologic Survey's Patuxent Wildlife Research Center & Canadian Wildlife Service's National Wildlife Research Centre 2004). The route has been sampled from 1995 through 2003, except during 2001. Another route was near Beech Creek and the Upper Neches Units. Surveying began in 1967 and has continued through 2003 except for 1991-1993 and 2001-2002. Christmas Bird Counts, another type of long-term monitoring project, were conducted on Turkey Creek Unit and Beech Creek Unit during December from 1979-2003 and Village Creek (not in park but nearby) from 2000-2003 (National Audubon Society 2004).

Species surveys, studies

Phelps (1967) described a sighting of 5-10 pairs of Ivory-billed Woodpecker in Big Thicket by John Dennis, an authority on woodpeckers. The Ivory-billed Woodpecker is now considered to be extinct, but these nomadic birds lived in deep swamps and were known to exist in the greater

Big Thicket Region. Zachary (1976) discussed the status of habitat for the Ivory-billed Woodpecker in the Big Thicket area and gave a detailed report of a sighting of a male in the area of Tompkin Mills Creek bottomlands.

Burke (1999) described the reintroduction effort of Wild Turkey (*Meleagris gallopavo silvestris*) in East Texas. Release sites focused on riparian corridors. They found that successful reintroduction required the control of the midstory forest level through burning, herbicides, or mechanical methods. Wild Turkeys were reintroduced one time in the Turkey Creek, Big Sandy, and Lance Rosier Units during 1994 (Strahan et al. 1996). Eichler and Whiting (2003) conducted a study that examined the nesting habits of the released Wild Turkeys in the pineywoods of eastern Texas. They compared successful and unsuccessful nest and used their findings to make management suggestions.

Healy (1984) conducted a study on Wood Duck roosts in the southern portion of BITH. A discussion of the low number of roost sites (8) is included.

Red-cockaded Woodpeckers (RCW) have been monitored in the park from 1983 to 1995. Limited monitoring has continued since that time. RCW surveys were conducted in Polk, Tyler, Liberty, and Hardin Counties in 2003 on lands adjacent to the park but they found no active colonies (D. Hutter, personal communication, 15 March 2004). Moldenhauer (n.d.) proposed a study to examine the role of disturbance in determining breeding bird communities in forest habitats. Bachman's Sparrow and Red-cockaded Woodpecker were species of particular interest due to their dependence on fire-maintained pine forests. Apel (1985) detailed a plan to protect RCW habitat and to increase populations though an introduction program. During a 1990 woodpecker survey, active and inactive clusters of RCW colony trees were located in the Alabama-Coushatta Indian Reservation adjacent to the Big Sandy Creek Unit. In a survey conducted the following year, a new RCW site was documented in the Big Sandy Creek Unit. Thomlinson (1993) conducted a study of landscape characteristics of RCW colonies located in the nearby Sam Houston National Forest. Stegman (1994) described management specific to RCW for BITH and detailed RCW population information for the state from 1991 to 1994. Maxey (1994) conducted multiple surveys for RCW roosts in the park. Data are contained in field notes and was summarized in the 1996 RMP (Strahan et al. 1996). These colonies are no longer active (D. Hutter, personal communication, 15 March 2004). Conner and Rudolph (1996) studied RCW populations in the Angelina National Forest, which is located north of the upper units of BITH. They examined the relationship between RCWs and southern pine beetles (*Dendroctonus frontalis*) that included population trends, loss of cavity trees, and infestation rates.

Greenlaw et al. (1998) conducted a study examining the use of mimic alarm calls by male Eastern Towhees (*Pipilo erythrophthalmus*) in four locations in the northeast and one site in BITH. Eastern Towhees were found to mimic alarm calls from three other species and use varied with site. These observations suggest that alarm calls may be influenced by auditory learning.

Experts: Jeff Reid, USFWS Lufkin TX, Craig Rudolf, Richard Conner

FISH

Fish have been generally well studied in BITH compared to most other taxa. A variety of reports have examined the fish community through summaries, general surveys (both individual unit and parkwide surveys), and individual species studies. Some recent surveys have also been conducted in conjunction with water quality surveys.

Summary reports

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including fish. They compiled a list of fish from Evermann and Kendall (1894), but they stated that the list was likely missing many of the species that existed because of the excellent water quality and vegetative cover and shear number of streams.

Eschelle (1974) provided a list of species based on specimens found in museums, which could exist at BITH. He described the species and pointed out species of interest or concern. Halstead (1981) examined the flora and fauna of the Pine Island Bayou Watershed. Species lists for fauna included 80 species of fish.

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles and amphibians. They documented two State Threatened species of fish, creek chubsucker (*Erimyzon oblongus*) and blue sucker (*Cycleptus elongates*) and one State Endangered and Federal Species of Concern, paddlefish (*Polyodon spathula*), in the counties in which the park units exist. The existence and status of these species have been updated and are included in Appendix A.

Strahan et al. (1996) summarized the baseline information on the biological resources at the park. They outlined the current knowledge of the fish species that have been documented and discussed the major surveys that have been conducted in the park.

According to the draft oil and gas management plan (2000), fish have been the most thoroughly surveyed group with a total of 92 species within the waters of BITH, including the same three listed species found by Harcombe and Callaway (1997a).

General surveys, studies

Suttkus and Clemmer (1979) examined data collected from 15 surveys during 1971 and 1977-1979 and documented 85 species of fish and their distributions in BITH. Species lists were developed for each of waterways: Pine Island Bayou, Neches River and River drainage, Beech Creek, Turkey Creek, Big Sandy Creek, Village Creek, Menard Creek, and Hickory Creek. Suttkus (1982) documented 45 species of fish from the waterways of Big Thicket during the September 1982 sampling period.

Harrel (1991) proposed to examine the biological water quality, including macroinvertebrates, unionid clams, and fish at eight stations in BITH and correlated the results of analysis with the physiochemical measurements. Hubbs et al. (1996) examined the changes that have occurred in the Big Thicket fish community since 1953. They found the species existing within the various streams were very similar to one another but varied drastically from those of the Edwards Plateau in Central Texas. Changes that have occurred were attributed to anthropogenic activities such as dredging, impoundments, and hypolimnetic reservoir discharges.

Individual unit surveys

In a limnological study during 1967 through 1969 of Massey Lake, which leads into the Lower Neches River Unit, Harrel (1973) documented 18 species of fish. Tilton (1986) discussed possible effects of the proposed Rockland Dam on inland fish and wildlife resources due to water level variations within the Neches River and floodplain. Pitman and Parks (1994) released 19 radio-tagged paddlefish into the B.A. Steinhagen Reservoir and monitored their movements during 1990 and 1991. One third of the fish moved through the floodgates into the lower Neches River and seasonal patterns of habitat use were detected. Finley et al. (1996) examined the habitat preferences of the paddlefish in the Lower Neches River to help determine the effects, if any, the saltwater barriers had on the paddlefish population. They found that paddlefish were not abundant in the Lower Neches River because upstream movements were prevented by the barriers and downstream movement limited by the saltwater wedges. Betsill (2003) described the problems associated with the paddlefish and the conservation efforts that have been employed.

Wenger and Singleton (1967) examined the fish, insect larvae, and physiochemical parameters of Village Creek and some of its tributaries. Village Creek showed no signs of pollution while its tributary, Mill Creek, was highly polluted. Moriarity and Winemiller (1996) studied the spatial and temporal variation of the fish community at Village Creek. They documented 44 species of fish and found that the variation in stream flow and habitat types appeared to favor small fish such as minnows that had a high reproductive effort. Harrel (1999) reviewed the changes in five meander scar lakes within the Village Creek drainage basin regarding their morphometry, biological (fish and invertebrate), physiochemical water quality, and dominant vegetation over 30 years. Dailey and Landry (2003) conducted a study on the effects of anthropogenic impacts on the fish assemblages in Village and Flat Branch Creeks from 1977 to 2000. They found a total of 65 species in both streams but found no trends in diversity during the 23-year sampling period.

Evans (1977) examined the species distribution, abundance, and diversity of fish throughout Big Sandy Creek during 1974 through 1976. Sixty-nine species of fish were documented. Factors such as flooding, drought, and migration were found to be more important in determining distribution than temperature, gradient, and environmental variation. Moring and Gilbertson (1993) documented fish species captured at the USGS NAWQA study site in Menard Creek Unit. Researchers noted that the excellent water quality may have reduced their ability to capture a higher percentage of resident species. Moring (2003a) conducted a water quality study that focused on the structure and function of the faunal community and its habitat as they relate to landuse in the upstream drainage in BITH. They found that fish species richness was not significantly correlated with landuse or habitat.

Nicoletto and Harrel (1999) examined the fish population of Lily Pad Lake in the Roy E. Larsen Sandyland Sanctuary. They studied the population dynamics of this shallow oxbow lake that is near the end of its aquatic ecological succession. Thirteen species were collected but only five of these could maintain populations through one of the periodic dry periods. Additional physiochemical data were collected.

Experts: Richard Harrel, Fred Rainwater

INVERTEBRATES

A number of surveys have been conducted on the terrestrial and aquatic invertebrate populations in the park, although many of them were conducted over 20 years ago. Most terrestrial studies have focused on the ecology of an individual species or group, although a few surveys have been conducted on the general species diversity of a unit or diversity of a group of species parkwide. Much of the information on the aquatic species has been gained through water quality sampling of the many waterways in the park.

Summary reports

Parks and Cory (1936) conducted a biological survey of the East Texas Big Thicket Area. The study examined multiple taxa including spiders, insects, crayfish, and shellfish. They loosely described the groups of Arachnida, Insecta, and Crustacea that likely exist but did not attempt to create a species list due to the lack of definite references. Based on a short survey, they also developed a list of twenty terrestrial and aquatic mollusks found in the area.

Harcombe (1996) and Harcombe and Callaway (1997a) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles and amphibians. They documented one Federally Endangered species, American burying beetle (*Nicrophorus americanus*), one Federal Species of Concern, Texas heelsplitter (*Potomilus amphichaenus*), and one State Rare species, Big Thicket emerald dragonfly (*Somatochlora margarita*), in the counties in which the park units exist. The existence and status of these species have been updated and are included in Appendix A.

Strahan et al. (1996) summarized the baseline information on the biological resources at the park. They outlined the current knowledge of the invertebrate species that have been documented and discussed the major surveys that have been conducted in the park. Current projects were also described.

Terrestrial Invertebrates

General surveys, studies

McCullough (1974) provided a summary of the information known about insects in BITH. The report identified 51 species existing at BITH. Harcombe and Hughes (1982) conducted a study to examine the insect species of BITH. They used light traps, sweep nets, searching and catching during 1980 and 1981 in the Turkey Creek Unit and documented 396 species. Burke et al. (n.d.) proposed to study the phytophagous and parasitic insects at BITH.

Rudolph and Ely (1999) conducted a study of adult Lepidoptera in four habitat types in eastern Texas. They found that the forest type and fire history influenced the diversity, abundance, and seasonal phenology of lepidopteran species.

Johnson (in Zipp 2001) conducted a study on the diseases carried by ticks in BITH.

Cook (2003) examined the leaf-litter ant population in the Big Thicket. On one study site he found 30 of the 100 or more species that were thought to inhabit the area, although the species composition varied throughout the year.

Hartley et al. (2003) examined the role of insects in the invasive success of Chinese tallow. They compared the insect populations found on Chinese tallow and three native species and collected 1091 species of arthropods. They did not find definitive evidence that the tallow experienced a release from herbivory that gave the species a competitive advantage over the native species.

Coles (2004) conducted a survey of the land snails in the major habitat types of BITH including mature beech/magnolia forest (Beech Creek Unit); mixed-bottomland woodland (Turkey Creek Unit), pine woodland (Turkey Creek Unit, Hickory Creek Unit, Lance Rosier Unit) and baygalls (Turkey Creek Unit, Hickory Creek Unit, Lance Rosier Unit). He documented 31 species, including the localized species, *Triodopsis vultuosa*, and two new species to Texas, *Paravitrea significans* and *Dryachloa dauca*. He also found that land snails were not prominent at the park and do not need to be a high priority in the park's conservation plan.

Species surveys, studies

A number of studies have focused on the ecology of the southern pine beetle and its effects on forests in the area. Gara et al. (1965) conducted a study on forest service lands near Beaumont that examined the effects of pheromones on southern pine beetle. They found beetle populations could be aggregated using this pheromone. In a later study, Gaumer and Gara (1967) investigated response of southern pine beetle development to phloem temperature and moisture. Coster (1967, 1970) and Coster and Gara (1968) continued research in the area to examine the effects of pheromones on the orientation of flying beetles, landing and boring activities, and the continuation and size of outbreaks. Lorio (1968) examined southern pine beetle activity and forest parameters and found that activity was correlated with soil type. Williamson and Vite (1971) examined the effect of insecticidal control on the southern pine beetle during a severe outbreak in Harden County that occurred during 1968-1970. Coulson et al. (1976) examined the resource utilization of loblolly pine (*Pinus taeda*) by the southern pine beetle. Ragenovich (1977) discussed the southern pine beetle and infestations as they related to each of the units in BITH. Maps and aerial observation were used to determine current status of infestation locations. Oliveria and Spriggs (1982, 1989, 1990) conducted surveys of southern pine beetle infestation through out the BITH. A possible suppression operation was proposed in 1982. By the later surveys, a pine beetle suppression was recommended. Bryant (1984) surveyed pine trees damaged by tornadoes for bark beetle infestation from winter 1983 through fall 1984, but no results are discussed.

Caskey (1971) collected Tardigrades (or moss piglets) samples from 174 sites, which consisted of all ten regions in Texas. He documented one new species and seven new reports for Texas.

A number of studies have been conducted on Lepidoptera populations of BITH. Rausher (1979a&b) conducted a study on the pipevine swallowtail butterfly (*Battus philenor*) on plots in Kirby State Forest 10 km north of Silsbee in Hardin County Texas. The females avoided laying eggs on leaves that already had eggs, presumably to reduce competition between young and increase offspring survivorship. Rausher and Feeny (1980) also examined the interaction between the pipevine swallowtail butterfly and its host species *Aristolochia reticulata* and found the plant had developed adaptive responses to herbivory, such as low nutrient availability in leaves, below ground flowering and fruiting, and elevated root to shoot ratio. Bordelon and Knudson (1994, 1995) compiled a list of Lepidoptera species which were collected within BITH. They documented over 1300 species in 7 of the BITH units and additional sites located within the area between the units. In a later report, Bordelon and Knudson (1999) reported a total of 1743 taxa from 65 families of Lepidoptera in the 9 counties of southeast Texas that encompass BITH. Including the other counties of the Big Thicket, the total species count was over 2000 and represented approximately 40% of the species known in Texas.

Various other studies have been conducted on invertebrate populations within BITH and the region. Gipson (1988) collected samples of the lesser grain borer (*Rhyzopertha dominica*) from southeast Texas, including sites in BITH, to examine the natural biology and effects of specific pesticides. Populations in the park peaked in September and emerged from loblolly pine seeds. Malathion was not as effective on the natural strains as Fenoxycarb. Lewis (1989) examined 11 vegetation associations within BITH to determine the distribution and seasonal variation of litter mites. Oribatid mites (Acari: Oribatida) accounted for almost 90% of all individuals, composed of 52 families and 103 species. Twenty-two species had never been recorded in Texas. Densities varied with the seasons with greater numbers in spring and less in summer due to litter moisture. There was no relationship between distribution and leaf litter composition and moisture. Carr (1990) conducted surveys for scarlet catchfly (*Silene subciliate*) on the Roy E. Larsen Sandyland Sanctuary and noted the location of populations within BITH. Kelley (1996) examined the diversity of tiger beetles (family Cicindelidae) in the Big Thicket and pineywoods. She found that the family is unusually diverse in the area with both common and endemic species.

Aquatic Invertebrates

General surveys, studies

Harrel (1973) conducted a limnological study of Massey Lake, an abandoned channel segment of Village Creek 16 km north of Beaumont. Forty-seven species of macroinvertebrates were documented with diversity decreasing to zero by a depth of three meters. Densities varied seasonally. Harrel (1999) reviewed the changes in five meander scar lakes within the Village Creek drainage basin regarding their morphometry, biological (fish and invertebrate) and physiochemical water quality and dominant vegetation over 30 years. According to the draft oil and gas management plan (2000), 249 species of macroinvertebrates have been documented during comprehensive surveys in the Village Creek drainages. Three species that are thought to exist within BITH and are aquatic for at least portions of their lifecycle are on the federal Species of Concern list.

Hobbs and Whiteman (1987) described a new crayfish found in the Neches River and discussed its economic importance. Hobbs (1990) examined crayfish within the Neches River and described three new species.

Abbott and Stewart (1996) examined the aquatic insects of the Big Thicket Primitive Area. They documented rare and Federal Candidate Category 2 species (species for which information indicates that listing is possibly appropriate, but conclusive data are not available) in the area. As part of a larger aquatic faunal study in nine ecosystems in the Primitive Big Thicket, Cook et al. (2003) examined the diversity of gregarine parasites found in nine orders of aquatic and riparian insects. They estimated that 130 new gregarine species will be recorded throughout the survey.

Garono et al. (1999) conducted a study in BITH to determine if insect assemblages could characterize various habitats. They examined four habitats: creek, baygall, woodland pond, and woodland stream.

<u>Water quality studies, general</u>

Harrel and Darville (1978) and Darville and Harrel (1980) examined the water quality for multiple waterways in the BITH, including Little Pine Island and Pine Island Bayous, Beech, Turkey, Big Sandy, and Menard Creeks. Streams generally had high water quality and a high diversity of macrobenthos but levels indicated a moderately stressed community. Flora et al. (1985) summarized the physiochemical and biological water quality data from previous studies (1975-1981) of the Big Sandy Creek, Beech Creek, and Turkey Creek Units. A graph was used to summarize the macroinvertebrate diversity. Barclay and Harrel (1985) examined water quality and macrobenthos of three streams either in or near BITH and found few species in the polluted streams. Water quality varied for the three streams with Village Creek the only one that maintained good quality year round. Many of the taxa that are considered intolerant of pollution were only found in Village Creek. Harrel (1991) proposed to examine the biological water quality, including macroinvertebrates, unionid clams, and fish at eight stations in BITH and correlated the results with physiochemical measurements. Moring (2003) conducted a water quality study that focused on the structure and function of the faunal community and habitat associations as they relate to landuse in the upstream drainage in BITH. They found arthropod communities were not significantly correlated with landuse or habitat.

Water quality studies, individual units/waterways

Wenger and Singleton (1967) examined the fish, insect larvae, and physiochemical parameters of Village Creek and some of its tributaries. Village Creek showed no signs of pollution while its tributary, Mill Creek, was highly polluted. Tatum and Commander (1971) examined the water quality of Village Creek, which runs through Turkey Creek Unit. They measured a variety of physical characteristics of the water, chemical levels, and macrobenthic organisms and found high water quality. They collected 56 different taxa of aquatic organisms. Lewis (1974) and Lewis and Harrel (1978) examined the physiochemical parameters and macrobenthos of Village Creek during 1972 and 1973 and found the water quality varied with the amount of discharge. Commander (1980) examined the physical parameters of water quality and macrobenthos of the Turkey Creek Unit during August 1979 through July 1980.

Patterson (1971) examined the effects of the saltwater barrier on the Neches River on the water quality and macrobenthic community in the area. Samples were taken pre, during, and post installation of the barrier. Howard (1973) examined physiochemical and biological parameters of the lower Neches River. Results of the salinity and structure of the benthic community were used to develop ecological zones. Harrel (1975) conducted a study examining water quality and saltwater intrusion in the lower Neches River. Samples were taken above (in the preserve) and below (both in and out of the preserve) the saltwater barriers. Saltwater intrusion occurs for up to half of the year, during which time the organisms existing in the lower 58 km of the Neches and 5 km of the Pine Island Bayou which are trapped behind the saltwater exclusion dams die due to a decrease in oxygenated water. Harrel et al. (1976) conducted a study to examine how saltwater intrusion and effluent from industrial sites affected the structure of the macrobenthos community in the Neches River during 1967 to 1972. Harrel and Hall (1991) compared macrobenthic samples from before (1971-1972) and after (1984-1985) a pollution reduction program on the Neches River. A significant improvement was seen in the post-reduction sampling.

Harrel (1976) examined the benthic macroinvertebrates from Beech Creek as well as water quality from newly created monitoring stations relative to pollution sources. Kost (1977) conducted a study of the water quality of the Beech Creek Unit of BITH. He examined streams for physiochemical conditions and macrobenthos from May 1976 to April 1977. Good water quality was documented throughout the creek.

Bass (1979) and Bass and Harrel (1981) examined the physiochemical properties of the water but also measured the fecal bacteria and macroinvertebrates found in Menard Creek. Physiochemical conditions were good within the stream but fecal levels were above acceptable levels throughout most of the study and especially after heavy rains. Bass (1982a) discussed the problems associated with quantifying stream macrobenthic populations. Harrel and Newberry (1981) and Newberry (1982) conducted a study of the water quality found in the Big Sandy

Creek Unit during a one-year period from fall 1980 to 1981 and examined the biological and physiochemical parameters of the water. Water quality in the unit during this period was good.

Species surveys, studies

Howells (1996) described the status of freshwater mussels (Family Unionidae) found in the Big Thicket Region. He found that 42 of the 52 species found in Texas have been documented in the Big Thicket. Several of these species, Texas pigtoe (*Fusconaia askewi*), triangle pigtoe (*Fusconaia lananensisq*), plain pocketbook (*Lampsilis cardium*), sandback pocketbook (*L. satura*), southern hickorynut (*Obovaria jacksoniana*), Louisiana pigtoe (*Pleurobema riddellii*), smooth pimpleback (*Quadrula houstonensis*), Texas fawnsfoot (*Truncilla macrodon*), were rare and classified as endangered, threatened or of special concern by the American Fisheries Society. During a survey of mussels in the B.A. Steinhagen Reservoir, Howells et al. (1999) were, by chance, able to study the combined effect of dewatering and cold temperatures on freshwater mussels. They found that those individuals that remained above the waterline died while those that remained below it survived.

Water quality studies

Bass (1985) conducted a study on the chironomid larvae found in the streams in Big Thicket from November 1981 to October 1982. Eighty-seven species were documented along with their habitats and analyses were conducted to examine species diversity, similarity, and density. Densities varied through the year, likely due to the life cycle of chironomids as well as changes in environmental factors such as waterflow. Physiochemical water quality measures were also recorded. Bass (1986) discussed the habitat ecology of chironomid larvae in the Big Thicket steams.

Harrel (1993) examined the status of the brackish water clam (*Rangia cuneata*) in the Neches River relative to saltwater barriers in Pine Island Bayou and Neches River and irrigation. If current (as of 1993) management of the river continued the species could be extirpated; however, certain changes could allow the population to regain stable numbers.

Harrel and McConnell (1994, 1995) monitored the toxicity levels in estuarine clams in the Neches River. Toxins were detected in all samples but the highest levels were detected in clams located in zones receiving paper mill effluent. These zones were upstream of the mill, indicating that saltwater intrusion transported material upstream or there were non-point sources of pollution.

Experts: Richard Harrel, Howell (clams)

THREATENED AND ENDANGERED SPECIES

A number of federal and state listed threatened or endangered species have been documented or have ranges that may allow them to exist in BITH. Appendix A is a compilation of these species adapted from a number of park documents and NPS biologists (D. Hutter, personal communication, 18 June 2004; Author unknown 2000; Big Thicket National Preserve 2004; Harcombe & Callaway 1997a; Strahan et al. 1996).

PHYSICAL PROPERTIES

GEOLOGY

A description of the natural environment (geology, hydrology, vegetation, fauna, etc.) was included in the environmental impact statement for the establishment of the park (National Park Service 1976). They described the history of the geological formations as well as the soils of the area. They listed 21 soil associations and classified the topsoil and subsoil as sandy, loamy or clayey. The 1996 RMP described the basic geomorphology of the areas (Strahan et al. 1996). The oil and gas management plan described the geologic resources of the park (Author unknown 2000). In addition to a description of the bedrock geology and soils, erodibility, compaction, shrink-swell potential and flooding frequency were also discussed. CXC (n.d.) described a plan for geophysical exploration of two units in BITH.

Formations

Donovan (1957) described the subsurface geology for northern Hardin County Texas. Baker (1964) described the geology as it relates to the groundwater of Hardin County. He described the extent of the major formations and the existence of various depositional and erosional features.

Aronow (1981) provided maps of the formations which occur for each of the units and corresponding detailed descriptions of the origins of the formations. Most of the park's formations date back to various points in the Quaternary Period, while some also extend back to the Tertiary. Aronow (1981, 1995) also described the geologic formations and origins in the Gulf Coast of Texas.

Maxwell et al. (1970) described the geomorphology of Martin Dies State Park along the Neches River, just north of the Upper Neches River Corridor Unit. The rocks found in the area are mostly black calcareous clay from the Fleming or Lagarto Formation. The deposits were formed during the Cenozoic Era from brackish water lagoons or shallow lakes, which supported clams, snails, and oysters. Fossilized remains of these groups as well as vertebrates such as beavers, camels, horses, and rhinoceroses have been found.

Soil

A study by students from Sam Houston State University (1975) examined the biological effects of creating BITH. They examined the vegetation, soil, and avian community. Deshotels (1978) conducted a soil survey for BITH and examined the soil properties, formation, use, and classification of the soils. Over 40 soil series were documented in the park in soils that formed under a forested landscape. Generally they were found to be light colored and loamy, with some wet or ponded soils, while soils along the Neches River contained more clay. He did not find erosion to be a major problem at BITH. Zygo (1999a) described the soil types found in BITH and reviewed the work that had been conducted on soil delineation in the park.

Sediment Transport

Foote et al. (1996) examined the seasonal transport of sediment in the Neches River Units. They attempted to determine the extent to which sedimentation is still an active process in the riparian corridors through the installation of sediment wells, water level dataloggers, and water sampling pumps.

Experts: Jesse Deshotels, Ed Janak, Chick Dolezel, Gaylon Lane

HYDROLOGY

Groundwater

A number of studies have been conducted on the groundwater in BITH and in the surrounding counties. The primary aquifer for BITH is the Gulf Coast Aquifer (National Park Service 1976). It is made up of the Fleming, Willis, Bentley, Montgomery, and Beaumont formations. Harrel and Watson (1975) described the water quality in the aquifer as good to excellent and found it was a significant resource.

The draft oil and gas management plan gave a detailed summary of the water resources for the park (Author unknown 2000). Groundwater is abundant and although the water quality varies according to composition and depth of the water-bearing formations, the water is generally of good quality. Groundwater sources were described for each of the three primary drainages or watersheds within BITH.

General studies

A couple of studies have been conducted in nearby areas. Gabrysch and McAdoo (1972) studied groundwater in the Houston District. Assaf (1976) examined the response of an aquifer to a simulated groundwater recharge.

Various authors have documented the status and quality of groundwater for the counties that contain the units of BITH. Baker (1964) documented the water quality and hydrologic data of the groundwater of Hardin County. He collected field data on the ground-water resources and provided a detailed description of the previous investigations that had been conducted in Hardin County or the general area. Wesselman (1965) discussed the high use of groundwater in Orange County from the middle and upper aquifers causing a 40 foot and 9 foot drop in water levels at the time, respectively, since 1941. Water extraction from the middle aquifer was limited by the possibility of saltwater encroachment. Water quality measurements from well sources were included. Tarver (1968a) described the groundwater resources for Polk County. Water within the aquifers was fresh to slightly saline and of good quality. Anders et al. (1968) described the ground-water resources, movement, uses, availability, and properties of well water for Liberty County. Large quantities of fresh water are available in the aquifers. A water quality report for Tyler County described the groundwater, movement, use, and well data (Tarver 1968b). Water was found to be suitable for most purposes. Aquifers were largely untapped for both counties. Wesselman (1967) described the groundwater for Jasper County and found excellent water quality. He discussed groundwater movement, use, availability, and water quality.

Surface water

Surface water quality has been well studied across BITH. An extensive amount of research has been conducted on the park's surface waters and how anthropogenic disturbances (e.g., dams, saltwater barriers, and sewage) affect the water quality.

A description of the natural environment (geology, hydrology, vegetation, fauna, etc.) was included in the environmental impact statement for the establishment of the park (National Park Service 1976). They listed all but Menard Creek Corridor in the middle and lower Neches River drainage basin. They also described activities that are potential problems for water quality.

Harcombe and Callaway (1997b) created a management assessment of the water corridor units in BITH. They described the impact to the resources, recommended management actions and proposed possible research for biodiversity, endangered species, exotic species, water quality, water flow, woody in-stream substrates, stream banks and floodplain habitat. They also provided a detailed review of the water quality work that has been done in the park and major finding of the research or monitoring.

The draft oil and gas management plan detailed the major drainages, hydrologic features, and flow for the park (Author unknown 2000). Water quality was described for each of the park's primary drainages and related studies were discussed.

Water quality surveys

Harrel (1977) discussed the water quality of the Lance Rosier, Big Sandy, Menard Creek, Turkey Creek, and Beech Creek Units during 1976. His water quality assessment was based on physiochemical and macrobenthic samples. Portions of Pine Island Bayou have been sampled by the Jefferson County Environmental Control Department, the City of Beaumont Water Reclamation Department, and the Texas Water Quality Board. They also made suggestions for future water quality sampling that would monitor possible pollution pertaining to a specific creek (e.g., pesticides in Pine Island Bayou during and after rice season or bacteriological data from Menard Creek due to sewage treatment). Harrel and Darville (1978) and Darville and Harrel (1980) also examined the water quality for multiple other waterways in the BITH including Pine Island and Little Pine Island Bayous, Beech, Turkey, Big Sandy, and Menard Creeks. They examined a variety of physical and biological parameters. Streams generally had high water quality and a high diversity of macrobenthos but levels indicated a moderately stressed community.

In a study examining the ecology of the chironomid larvae found in the streams of Big Thicket, Bass (1981, 1982b, 1985) collected information on the physiochemical water quality of the streams. They included data for measurements such as temperature, dissolved oxygen, pH, alkalinity, and carbon dioxide.

Flora (1984) discussed the development of a Water Quality Monitoring Program on the park and delineated historical monitoring sites as well as suggestions for future sites. Hughes et al. (1987) summarized the first two years of the BITH monitoring study, comparing data with results from previous studies conducted by non-NPS agencies. Water quality was examined to determine the effects of logging, exploration for fossil fuels, and development. Although general water quality was improving, there was some evidence of detrimental effects caused by exploration and development.

Barclay and Harrel (1985) examined water quality and macrobenthos of Village Creek and two nearby streams and found few species in the polluted streams. They collected 155 taxa of macroinvertebrates. Many of the taxa that are considered intolerant of pollution were only found in Village Creek.

Harrel (1991) proposed to examine the biological water quality, including unionid clams, other macroinvertebrates, and fish at eight stations in BITH and correlated the results of analyses with physiochemical measurements. Yearly reports documented the general physiochemical parameters (temperature, conductivity, pH, dissolved oxygen, and turbidity) and biological (fecal coliform and fecal streptococci) measurements for the BITH Water Quality Monitoring Program. Kaiser et al. (1993) discussed the water quality monitoring and addressed issues or problems existing at BITH.

Whitefield et al. (1996) discussed the Water Quality Monitoring Program that began in 1984 including data collected, past analyses, water quality trends and possible explanations for these trends.

Rizzo et al. (1996, 1999, 2000) conducted a water quality study in six drainage basins in BITH during 1996 through 1999. Water quality varied across the park. Big Sandy Creek, Turkey Creek, and Village Creek had the best water quality while Neches River was generally good but had periods with moderate algae blooms. Pine Island Bayou system generally had poor water quality with high nutrient loads and low velocities.

The Lower Neches Valley Authority (LNVA), in conjunction with the Texas Natural Resource Conservation Commission, monitors the water quality (using biological, chemical, and physical stream characteristics) for most of BITH. The 2002 report reviewed the water quality from January 1997 to November 2001 (LNVA 2002). They found the water quality was generally good but identified portions of Pine Island Bayou and Village Creek that were impaired due to depressed dissolved oxygen, low pH, and/or elevated coliform. Trinity River Authority Lake Livingston Project (n.d.) conducted water quality analysis on the waters at BITH. They measured alkalinity, chloride, color, sulfate, solids, fecal coliform, and fecal streptococcus.

Moring (2003) examined water quality but focused on the structure and function of the faunal community and its habitat relative to landuse in the upstream drainage in BITH. They found arthropod and fish communities were not significantly correlated with landuse or habitat.

Water quality data for surface water in the state, including the Big Thicket region, has been monitored by Texas Commission on Environmental Quality (TCEQ) since 2000. To comply with Section 303(d) of the Clean Water Act, states are required to compile a list of impaired waters every two years. The 2000 list contained eight waterbodies in BITH (Table 5). Data and summaries of the physical, chemical, and biological parameters of these and other waterbodies are listed on the TCEQ website (TCEQ 2004).

Table 5. Waterbodies within BITH listed on the Texas state 2000 303(d) list, which denotes waterbodies that do not meet the standards set for their use.

Waterway	Concern	Summary
BA Steinhagen Lake	mercury in fish tissue	The fish consumption use is partially supported, based on a restricted-consumption advisory issued by the Texas Department of Health in November 1995 due to elevated concentrations of mercury in fish tissue
Beech Creek	depressed DO	Dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life
Big Sandy Creek	bacteria	In the upper 25 miles, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation
Hickory Creek	bacteria	Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation
Little Pine Island Bayou	depressed DO	In the lower 25 miles, dissolved oxygen concentrations are sometimes lower than the criterion established to assure optimum conditions for aquatic life
Pine Island Bayou	depressed DO, bacteria, low pH	In the upper 75 miles, dissolved oxygen concentrations are sometimes lower than the criterion established to assure optimum conditions for aquatic life. In the lower 6 miles, dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. In the middle 25 miles, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation. In the lower 43 miles, pH values are occasionally lower than the criterion established to safeguard general water quality uses
Turkey Creek	bacteria	In the upper 25 miles, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation
Village Creek	low pH	In the upper 33 miles, pH values are sometimes lower than the criterion established to safeguard general water quality uses

Water quality surveys, individual units/waterways

Adsit et al. (1978) conducted an extensive monitoring effort of the water quality for a section of the Pine Island Bayou during the fall of 1975 and July of 1976. Biological, chemical, and hydrologic properties of the water were examined and they found the water quality was poor. Possible causes including both point and non-point sources were discussed. Commander (1978) examined the fecal coliform and fecal streptococcus load in Pine Island Bayou to determine sources for the contamination as well as any variation due to high or low flow volume. Sampling of 12 streams sites and all wastewater treatment plants occurred during January-February and April-May 1978. Violations of the fecal coliform stream standard occurred for all plants during the winter sampling period and five plants during the spring. They found that more contamination occurs from stormwater runoff than from all treatment plants combined. Darville (1978) examined the physical and biological water quality for Pine Island and Little Pine Island

Bayous. Physiochemical conditions were good within the streams but fecal levels were above acceptable levels on all stations at least once during the study, generally after heavy rains. Becker and Costa (1983) conducted a study of non-point pollution of a segment of Pine Island Bayou. Hebert (1985) discussed the condition of water quality and pollution sources in the Pine Island Bayou and Village Creek area. He also discussed the role the LNVA should play in the monitoring of water resources outside the park and the maintenance of high water quality.

Wenger and Singleton (1967) examined the fish, insect larvae, and physiochemical parameters of Village Creek and some of its tributaries. Village Creek showed no signs of pollution while its tributary, Mill Creek, was highly polluted. Tatum and Commander (1971) examined the water quality of Village Creek, which runs through Turkey Creek Unit. They measured a variety of physical characteristics of the water, chemical levels, and macrobenthic organisms and found high water quality. No saltwater seepage or encroachment was detected. They collected 56 different taxa of aquatic organisms. Lewis (1974) and Lewis and Harrel (1978) examined the water quality of Village Creek from 1972 to 1973 and found that the values varied according to the discharge amount. Commander (1980) and Harrel and Commander (1980) examined the physical and biological measures of water quality of the Turkey Creek Unit during August 1979 through July 1980. A slight bacterial contamination was detected and one period showed elevated levels of chloride. Aside from slightly elevated chloride levels, which were likely a result of oil field brines, the water quality in the unit was excellent. The U.S. Geological Survey (USGS) measured the discharge of Menard Creek from 1964 through 1980 (USGS 1980). Harrel (1999) reviewed the changes in five meander scar lakes within the Village Creek drainage basin regarding their morphometry, biological (fish and invertebrate) and physiochemical water quality, and dominant vegetation over 30 years.

In a limnological study of Massey Lake, Harrel (1973) found the lake was monomictic and only during January and February was it isothermal. Below 2 to 4 meters, the lake was anoxic during most of the year. Marsh (1973) examined the species diversity and abundance of phytoplankton and rotifers in Massey Lake during 1991 and 1992. Data were also collected on various water quality parameters and their seasonal variation.

Patterson (1971) examined the effects of the saltwater barrier in the Neches River on the water quality and macrobenthic community in the area. Samples were taken pre, during, and post installation of the barrier. Harrel (1975) conducted a study examining water quality and saltwater intrusion in the lower Neches River. Samples were taken above (in the preserve) and below (both in and out of the preserve) the saltwater barriers. Saltwater intrusion occurs for up to half the year, during which time the organisms existing in the lower 58 km of the Neches and 5 km of the Pine Island Bayou which are trapped behind the saltwater exclusion dams die due to a decrease in oxygenated water. A USGS (1984) printout contained physiochemical water quality data collected at Evadale on the Neches River from 1960 to 1984. Wells and Bourdon (1985) conducted statistical analyses of water quality data from three sites in the Lower Neches River Basin to document baseline conditions in these stream segments. The Fort Worth District Corps of Engineers measured water flow from river basins in Texas including the Neches River basin and provided monthly reports from 1993 to 1995 (e.g., Fort Worth District Corps of Engineers 1993a, b).

Harrel (1976) created monitoring stations for water quality. He discussed data collected during 1975 on the water quality, pollution sources, and benthic macroinvertebrates from Beech Creek. Kost (1977) conducted a study of the water quality of the Beech Creek Unit of BITH. He examined streams for physiochemical conditions (e.g., temperature, dissolved oxygen, chlorophyll, pH, and turbidity, among others) and macrobenthos from May 1976 to April 1977. Water quality was good on all streams.

Harrel and Bass (1979) conducted a water quality study examining the physiochemical conditions of Menard Creek within BITH. In a following year-long study, Bass (1979) and Bass and Harrel (1981) examined the physiochemical properties of the water but also measured the fecal bacteria and macroinvertebrates found in Menard Creek. Physiochemical conditions were good within the stream but fecal levels were above acceptable levels throughout most of the study and especially after heavy rains. Harrel and Newberry (1981) and Newberry (1982) conducted a study of the water quality found in Big Sandy Creek Unit during a one-year period from fall 1980 to 1981 and examined the biological and physiochemical parameters of the water. Water quality in the unit during this period was good. Moring (1996) described preliminary findings from the USGS's National Water Quality Assessment Program surveys of Menard Creek. Aquatic biota (fish, macroinvertebrate and periphytic algae) and sediments were analyzed for organochlorine, polychlorinated biphenyls (PCBs) and trace elements. Organochlorines were not detected and trace elements were found but not attributed to anthropogenic sources. Moring and Zipp (1999) further described this study and discussed the possible threats to the integrity of the aqueous ecosystems that run through the park, including urbanization, industrial effluents, logging, and oil and gas operations.

Water quality summaries

Harrel and Watson (1975) summarized previous limnological and hydrological research which had been conducted in the area. Flora et al. (1985) summarized the physiochemical and biological water quality data from previous studies (1975-1981) of the Big Sandy Creek, Beech Creek, and Turkey Creek Units. Graphs and figures were used to summarize this baseline data.

Hughes et al. (1986) summarized previous water quality data for the Menard Creek Corridor, Lance Rosier, and Little Pine Island Bayou Corridor Units from 1975-1983. Graphs depicted degraded water quality for most of these units with high bacterial, specific conductance, and chloride levels.

A baseline inventory of water quality of BITH, which examined data from the Environmental Protection Agency's (EPA) databases, found 15 groups of parameters that exceeded water quality screening limits at least one time in the study area (Horizon Systems Corp. 1995). Seventeen of the 41 monitoring stations were located within the park; the rest exist within the study area. This report described waters that have been historically impacted by anthropogenic activities such as oil and gas exploration and development, wastewater discharge, development, agriculture, and timber harvesting practices.

The 1996 RMP described the status of the water quality monitoring in the park (Strahan et al. 1996). Hall and Bruce (1996) examined existing data on the water quality of BITH. They summarized the normal patterns for key parameters and compared them with compatible waterbodies in the coastal plain, documented previous water quality problems, searched for long-term trends in the dataset, and noted any gaps in the current sampling methods.

Experts: Richard Harrel, Andrew Brono (LNVA), Rizzo (USGS), Moring (USGS Austin), H. Ross (TCEQ Water Section Manager Beaumont)

AIR QUALITY

A couple of studies have taken place in BITH to examine the air quality of the park, although much of this monitoring took place 10-20 years ago. More recent data can be obtained from regional sampling stations in Texas and neighboring states.

Egan and Gordy (1981) conducted a study to examine the effects of sulfur dioxide on epiphytic lichens in BITH. Air quality modeling indicated that sulfur dioxide levels were below the damage threshold. AeroVironment and the Radian Corporation conducted air quality monitoring in BITH in the late 1980's to the early 1990's (AeroVironment Inc. 1985, 1989; Radian Corporation 1993). In their summary of ozone levels for national parks, Joseph and Flores (1993a&b) summarized the ozone measurements for BITH from 1981 to 1991. Somerfield (in Zipp 2001) conducted a study on the extent of airborne organochlorine contamination throughout eastern Texas.

Wisner (1992) described a plan to study ozone levels in the Beaumont-Port Arthur-Orange area and surroundings and included sample data. According to the 1996 RMP, the park is located near two areas of non-attainment in Texas, the previously mentioned Beaumont-Port Author-Orange, and Houston-Galveston airsheds (Strahan et al. 1996). These areas do not meet the National Ambient Air Quality Standards set by the EPA. The 1996 RMP also described the air quality of the park and nearby pressures that directly impact the park's resources. They discussed monitoring efforts and studies that addressed the use of bioindicators (e.g., lichen and Spanish moss) in the park to monitor the effect of air pollution on park resources. Due to the sensitivity of lichens to low sulfur dioxide levels, a study was conducted to determine if pollution from these neighboring airsheds were damaging park resources. A second study conducted across the Gulf and Southeast states, including sites around BITH, sampled for elements found in Spanish moss. No evidence was found of lichen damage but elevated levels of several metals were found in samples taken in the nearby industrialized areas. An Air Quality Monitoring Station was installed on the Turkey Creek Unit and collected air quality measurements in the park from 1986 through 1992. The site has since been relocated to another NPS park. Data for this site was compiled into to two NPS documents by the NPS Air Quality Division (Joseph & Flores 1993a, b). They also provided details on the Southeast Texas Regional Planning Commission's Air Quality Advisory Board and Air Quality Steering Committee.

The park's air quality was discussed in an environmental impact statement for the oil and gas management plan (Author unknown 2000). BITH is located near two of the most polluted airsheds in Texas and lies within the non-attainment area for ozone in multiple counties.

Particulate matter (PM) was monitored in the park during 1996. Of the 18 sites across Texas in this study, BITH had the highest levels of fine fraction PM. Industrial activity associated with oil and gas production could contribute to these high levels.

The air quality of BITH can be assessed from National Atmospheric Deposition Program/National Trends Network (NADP/NTN) data collected from three Texas sites, the Attwater Prairie Chicken National Wildlife Refuge (NWR), Colorado County (site #TX10, ~140 miles WSW of BITH) and Nacagdoches County (site #TX38, ~80 miles N of BITH). Attwater Prairie Chicken NWR data shows no trend in the concentration or deposition of wet sulfate, concentration or deposition of wet nitrate, and concentration or deposition of wet ammonium. The Nacagdoches County data, which ceased operation in 2001, show that while there was a decrease in concentration and deposition of wet sulfate, there was no overall trend in concentration and deposition of wet nitrate or concentration and deposition of wet ammonium (T. Maniero, personal communication, May 2004).

Air quality can also be assessed from four NADP Mercury Deposition Network (MDN) sites including one in Longview, Texas (site #TX21, ~145 miles N of BITH) and three in Louisiana, Alexandria (site #LA23, ~115 miles NE of BITH), Chase (site #LA10 ~140 miles NE of BITH), and Lake Charles (site #LA05, ~65 miles E of BITH). There are no MDN monitors in central or southeast Texas (T. Maniero, personal communication, May 2004).

The nearest Clean Air Status and Trends Network (CASTNet) sites to BITH are in Big Bend National Park, Texas (site #BBE401, ~550 miles W of BITH) and at Caddo Valley, Arkansas (site #CAD150, ~275 miles NE of BITH). The nearest Interagency Monitoring of Protected Visual Environments (IMPROVE) site is at Sikes, Louisiana (#SIKE, ~150 miles NE of BITH) and at Wichita Mts. NWR, Oklahoma (~390 miles NW of BITH). The nearest CASTNet, Caddo Valley, which was recently installed and the nearest IMPROVE, Sikes, circa 1992, are too distant to be meaningful for assessing acid deposition or visibility on BITH (T. Maniero, personal communication, May 2004).

Experts: TCEQ - Beaumont, Southeast Texas Region Planning Commission, Mike George (NPS air quality division), S. Mueller (TCEQ Air Section Manager Beaumont)

ECOSYSTEM STUDIES

BITH is composed of five main forest types with subcategories within; upland pine forest (pine sandhill, pine forests, pine savanna wetland), slope forest (upper slope pine oak, mid-slope oak pine, lower slope hardwood pine), floodplain forest (stream floodplain forest, river floodplain forest, cypress-tupelo swamp), flatland forest (flatland hardwood pine, flatland hardwood), and baygalls. These habitats can be grouped in more general terms into waterbodies and forested lands. Multiple studies have examined the vegetation, water quality, productivity, animal community and effects of saltwater intrusion on these habitats.

FOREST

A number of studies and surveys have been conducted on the vegetation and conditions in the various forested habitats within the park. These studies examined plant communities and vegetation types as well as the effects of various stressors (e.g., water, light, fire, weather, and climate) on the species composition and growth of a forest. Studies also examined the faunal community that inhabits the forests within BITH.

General or multiple forest types

Smeins and Hartman (1975) describe the forest structure of the Big Thicket Scenic Area.

Harcombe and Marks (1975a, 1978b) defined and described the plant communities and vegetation types found in BITH. Forest types were classified into five main types with subcategories within; upland pine forest (pine sandhill, pine forests, pine savanna wetland), slope forest (upper slope pine oak, mid-slope oak pine, lower slope hardwood pine), floodplain forest (stream floodplain forest, river floodplain forest, cypress-tupelo swamp), flatland forest (flatland hardwood pine, flatland hardwood), and baygalls.

Streng and Harcombe (1978) conducted a transect survey of the existing fuel load of the four plant communities in Hickory Creek Unit. They discussed the fuel type and moisture content and found that it varied by community.

Harcombe and Marks (1978a) examined the correlation between dominant tree species and the replacement sapling species in BITH. Wetter habitats had less of the dominant species and a corresponding higher diversity of species in the sapling populations.

Glitzenstein (1979) and Glitzenstein and Harcombe (1979) examined the variation in bark texture of southern red oak (*Quercus falcata*) on four sites in and around BITH. Bark roughness increased from mesic sites to xeric sites possibly due to a relationship with fire resistance, pathogen susceptibility, or conservation of nutrients.

Lewis (1984) examined the carbon and nitrogen ratios in the eleven vegetation associations within BITH and found little variation between units.

Hall et al. (1994) conducted a study to examine the effects of long-term climate change on Gulf Coast forests. Sapling and tree growth, soil moisture and temperature, and general weather and climate data were collected on study sites in Big Thicket. Winters (1996) conducted a study on the effects of weather on within-season tree growth as an indicator of climate change. Within-season growth was affected by temperature, rain, soil moisture, and deficit but site patterns and natural growth patterns created variations between species.

Caird (1996) and Caird and Harcombe (1996) conducted a study to examine the effectiveness of soil moisture monitoring sensors to characterize sites based on soil and soil water measurements, and to model soil moisture stress on these sites. Xeric sites were differentiated by the model but the mesic and hydric sites were not.

Lin and Harcombe (1999), Lin (2002), and Lin et al. (2003) examined the effect of low light on growth in three forest types, mature mesic, floodplain, and sandy upland pine-oak forests, in BITH. Shade-tolerant species had higher levels of growth in low light in all forest types but survival varied according to forest type. Flooding may limit survival in floodplain forest type.

A couple of studies have also occurred on the inhabitants of forested habitats. Deuel and Fisher (1977) and Deuel (1977) conducted a study of the forest birds found in BITH. They conducted transect surveys by foot and canoe during spring of 1976 to determine species richness and abundance of four forest bird communities. McGuffin (1984) conducted line transect surveys in the Loblolly Unit to examine the structure of the forest bird community during 1983. Sixty-two bird species were documented. Data were analyzed to determine species abundance, diversity, absolute density, detectability, and dominance. Lewis et al. (2000) conducted a study of the herpetofauna in four forest types in Big Sandy Creek Unit. They documented 40 species and recorded over 1800 individuals. Species diversity varied with the forest type and was influenced by moisture availability. The two lower elevation mesic forest types had a greater abundance of amphibians and snakes.

Mesic forests

Harcombe and Marks (1977) examined the understory structure of Wier Forest, a mesic forest located 16 km north of Beaumont. They found a high species diversity in the understory and attributed it to the high level of light that reaches the lower levels and creates the opportunity for differentiation of understory position between species.

Using 18 years of data from Wier Woods, Harcombe et al. (2002) examined whether competition or unpredictable factors determined stand dynamics. They found that the competition for light directed succession but that other factors also influenced the succession and would therefore limit the ability to predict change.

Jha et al. (2003) studied the decline of large DBH American beech (*Fagus grandifolia*) populations at Wier Woods. They examined and discussed four possible causes.

Pine Savannah

A variety of studies have occurred in the savannah habitat in the park, examining a variety of biotic factors and the effects of management or catastrophic disturbance on the system.

Streng (1979) and Streng and Harcombe (1982) conducted a study to examine the plant species, soil, tree growth and age, and landuse in four plant communities in BITH. They found that two contiguous savannahs were maintained through different mechanisms, acidic soil and shallow claypan and burning.

Moldenhauer (n.d.) proposed a study to examine the role of disturbance in influencing breeding bird communities in forest habitats. Bachman's Sparrow and Red-cockaded Woodpecker were species of particular interest due to their dependence on transitional habitat. Rayburn (1986) proposed to examine aerial photos to document the transition from longleaf pine savannahs to hardwood or scrub thicket due to an exclusion of fire from the park.

Glitzenstein and Harcombe (1988) examined the effect a 1983 tornado had on the species, loss of canopy, and effects on the future forest structure in the Hickory Creek and Turkey Creek Units of BITH. Forest composition was altered, in the short-term, due to the high mortality of trees of the larger size classes. McClung (1988) examined the effects of 50-years of excluding fire from the longleaf pine savannahs in the eastern half of the Hickory Creek savannah Unit in BITH. Spatial analysis generally indicated a reduction in longleaf pine savannah and an increase in hardwood and pine-hardwood habitat. The data indicate that fire is an essential component in the maintenance of this ecosystem. Kaiser (1996) modeled the future of a 65-year old mixed pine-oak stand in the Turkey Creek Unit with no fire for the previous 20 years. Models of current management depict a slow decline of the longleaf pine population, while fire use caused an increase in the population. However, the models suggested that the survival of larger individual trees have created a resilient population.

Liu (1995) and Liu et al. (1996) studied the effect of fire on vegetation at BITH and found strong short-term effects on small trees in the drier sites but these effects diminished along the moisture gradient. There was no indication that pre-fire vegetation would return to another type although data from the Hickory Creek tornado site have shown some reversals of succession due to fires. Liu (1997a) examined the effect of a tornado and fire on species composition of a savannah. The tornado removed pines and encouraged the growth of hardwoods, which created a shift toward the pine-hardwood vegetation type. Some of those plots reverted back to savannah with prescribed burns. In a separate article, Liu (1997b) described a study that examined the effects of fire on different vegetation communities. Effectiveness of prescribed burns was found to be influenced by topography and soil gradients.

Glitzenstein et al. (1996) monitored the species composition of a fire-suppressed upland forest in the Turkey Creek Unit for 16 years. They found that the saplings of the canopy species were being replaced by species typical of a more mesic habitat and suggested that continued fire suppression will cause the current community to be replaced by mesic hardwoods. Harcombe et al. (2003a) discussed the status of this ongoing long-term study.

Milton (1998) conducted a study to examine the use of prescribed winter burns on a tornado damaged mixed pine-oak forest to revert it back to a historical pine savannah. An increase in upland shrubs has decreased the flammability of some sites and decreased the effectiveness of low intensity fires. A recommendation for high intensity repeated summer fires was suggested to reclaim the area.

Forested wetlands/floodplains

Mohler (1979) conducted a study of the floodplain vegetation of the Lower Neches. Information was gathered on species diversity and density as well as the influence of soil moisture and flooding. He found that soil moisture and flooding were more important in determining composition then interspecies effects. Woods (1979) examined streambed vegetation as it varied along an elevational-moisture gradient within the Upper and Lower Neches, mid-Corridor, and Jack Gore Baygall and Neches Bottom Units. He documented species and their location along the streambed.

Multiple studies have focused on the influence of flooding on growth and regeneration. Hall and Harcombe (1987) compared tree rings from the Upper Neches above and below the Sam Rayburn Dam to examine the effect of flooding on growth and found no difference between the sites. Hall (1993b) examined the effect of flooding and canopy gaps on growth and recruitment of saplings in the Neches River Basin. Hall (1993a) analyzed data from Neches Bottom to determine the impact of the Town Bluff dam on the river basin. The flooding cycle was altered and a number of expected alterations to the river and habitat were discussed, including channel morphology, sedimentation, water quality, submerged habitats, meandering, and vegetation. Hall and Harcombe (1998) conducted a study to examine how light availability and flooding affected the spatial pattern of sapling establishment from 1980 to 1990. Although saplings responded to both light and flooding, the interaction of the two sometimes caused flood tolerant species to grow in lower light conditions than usual and flood intolerant species to grow in higher light conditions than usual. Using 15 years of data from the Neches Bottom-Jack Gore Baygall Unit, Hall and Harcombe (2001) examined yearly variation in sapling recruitment and mortality. Yearly variation was high but recruitment rates generally fluctuated less then death rates. Sapling mortality was related to the flooding patterns while recruitment was related to drought and soil moisture availability.

Streng et al. (1989) conducted a study on seedlings and seed dispersal in a river floodplain and examined the effect of flooding, drought, herbivory, light availability, fungus, and conspecific adults on seedling survival. Light seeded, heavy mast species were susceptible to flooding, drought, conspecific adults, and herbivory, but heavy seeded, light mast species were not generally affected by these conditions. These differences can cause flooding or other environmental factors to alter the composition of seedlings and influence future canopy structure.

Williams et al. (1999) conducted a restoration of bottomland hardwood forest in the Roy E. Larsen Sandyland Sanctuary. They examined the seedling survival, vegetation recruitment and the effect of herbicides on controlling the invasion of Chinese tallow.

Lakes, wetlands

Harrel (1973) conducted a limnological study from 1967 through 1969 of Massey Lake, which leads into the Lower Neches River Unit. He found the lake was monomictic and only during January and February was it isothermal. Forty-seven species of macroinvertebrates were documented and densities varied among seasons. Eighteen species of fish were documented. In a separate study Harrel (1975) examined water quality and saltwater intrusion in the lower Neches River. Samples were taken above (in the preserve) and below (both in and out of the preserve) the saltwater barriers. Saltwater intrusion occurs for up to half the year, during which time the organisms existing in the lower 58 km of the Neches and 5 km of the Pine Island Bayou, which are trapped behind the saltwater exclusion dams, die due to a decrease in oxygenated water. Tilton (1986) examined the possible effects of the proposed Rockland Dam on the Neches River and BITH. It included a discussion of the importance of a natural water state for tree and fish populations.

Pecotte (1985) described proposed research to study the vegetation, soil, plant diversity and dominance, and historic disturbance of wetland pine savannah communities in BITH. Fleming and McHugh (1979a) proposed a management plan for *Sarracenia* bogs in the Turkey Creek Unit in which they recommended removing trees and implementing prescribed burns. Through the use of historical aerial photographs, a history of the *Sarracenia* bogs was developed and recommendations were made to use prescribed burns to maintain the bogs (Big Thicket National Preserve n.d.-a).

Zygo (1999a&b) examined the type and distribution of wetlands in BITH and analyzed the accuracy of various maps and surveys to delineate these wetlands. The draft oil and gas management plan (2000) provided a detailed description of the wetlands in BITH. Prominent vegetation, habitat and soil types were discussed.

Harrel (1999) reviewed the changes in five meander scar lakes within the Village Creek drainage basin regarding their morphometry, biological (fish and invertebrate) and physiochemical water quality and dominant vegetation over 30 years.

Nicoletto and Harrel (1999) examined the fish community of Lily Pad Lake in the Roy E. Larsen Sandyland Sanctuary. They studied the population dynamics of this shallow oxbow lake that is near the end of its aquatic ecological succession. Thirteen species were collected but only five of these could maintain populations through one of the periodic dry periods. Additional physiochemical data were collected.

Waterways

Harcombe (1996) compiled data from past research and published literature to characterize the biological community of the water corridors of BITH, including vegetation, mammals, birds, fish, invertebrates, reptiles and amphibians. Harcombe and Callaway (1997b) created a management assessment of the water corridor units in BITH. They described the impact to the resources, recommended management actions and proposed possible research for biodiversity, endangered species, exotic species, water quality, water flow, woody in-stream substrates, stream banks and floodplain habitat. They also provided a detailed review of the water quality work that had been done in the park and major findings of the research or monitoring.

Because many of the units are focused along water corridors in the area, many of the studies that have been conducted are in some way connected to the waterways. Reference to these studies has been have not been repeated in this section.

MANAGEMENT ISSUES

Because of the park's proximity to multiple urban centers, including Beaumont and Houston, BITH is subject to many environmental problems, including air and water quality, disturbed lands, hydrologic disruption, exotic species, and pests. This proximity to urban landscapes has also indirectly effected the vegetation and faunal community due to exclusion of fire from the fire-dependent ecosystems in BITH. Many of these issues have been well studied in BITH and are summarized in the following section. A detailed list of management issues and concerns that face BITH and how these issues may affect the park's resources can be found in Appendix B.

NATURAL DISTURBANCE

Fire

Fire was an important component to the Big Thicket region. A number of studies have examined the role of fire in these ecosystems and the resulting changes that have occurred due to its removal.

Walker (1976) discussed the potential for fire at BITH and the effects it would have on soil and vegetation. He recommended prescribed burning for the area. Watson (1977b) described the vegetation changes that have occurred in the Hickory Creek Savannah Unit due to human disturbance and fire suppression. Watson (1985a) discussed the use of fire in the BITH habitat and the failure of the burn program at the time. A more intensive approach was advocated. Watson (1985b) refuted the use of vegetation maps made by Harcombe and Marks for fire management decisions. Watson (1986b) described the role of fire in managing BITH ecosystems. Watson (1986a) described how the resulting landscape affected the animals that inhabited the area.

Reeves and Corbin (n.d.) discussed the use of prescribed burns at BITH and described fire adaptation that exists in these habitats. Rayburn (1986) proposed to examine aerial photos to document the transition from longleaf pine savannahs to hardwood or scrub thicket due to an exclusion of fire from the park. McClung (1988) examined the effects of 50-years of excluding fire from the longleaf pine savannahs in the eastern half of the Hickory Creek Savannah Unit in BITH. Spatial analysis generally indicated a reduction in longleaf pine savannah and an increase in hardwood and pine-hardwood habitat. The data indicate that fire is an essential component in the maintenance of this ecosystem.

Liu (1995) and Liu et al. (1996) studied the effect of fire on vegetation at BITH and found strong short-term effects on small trees in the drier sites but these effects diminished along the moisture gradient. There was no indication that pre-fire vegetation would return to another type although data from the Hickory Creek tornado site have shown some reversals of succession due to fires. Liu (1997a) examined the effect of a tornado and fire on species composition of a savannah. The tornado removed pines and encouraged the growth of hardwoods, which created a shift toward the pine-hardwood vegetation type. Some of those plots reverted back to savannah with prescribed burns. In a separate article, Liu (1997b) described a study that examined the effects of fire on different vegetation communities. Effectiveness of prescribed burns was found to be influenced by topography and soil gradients. Milton (1998) conducted a study to examine the use of prescribed winter burns in a tornado damaged mixed pine-oak forest to revert it back to a historical pine savannah. An increase in upland shrubs had decreased the flammability of some sites and decreased the effectiveness of low intensity fires. A recommendation for high intensity repeated summer fires was suggested to reclaim the area.

Glitzenstein et al. (1996) monitored the species composition of a fire-suppressed upland forest in the Turkey Creek Unit for 16 years. They found that the saplings of the canopy species were being replaced by species typical of a more mesic habitat and suggested that continued fire suppression will cause the current community to be replaced by mesic hardwoods.

Hurricanes

Bill and Harcombe (1996) examined the effect of Hurricane Bonnie on the mesic forest, Wier Woods in the Big Thicket. They found substantial tree mortality but due to the low frequency of occurrence and the relatively moderate impact, hurricanes may not adversely impact the forest structure and dynamics in Big Thicket.

Southern Pine Beetle

Due to the tremendous effect outbreaks can have on the forest community, a number of studies have focused on the ecology of the southern pine beetle and its effects on forests in the area. Gara et al. (1965) conducted a study in Forest Service lands near Beaumont which examined the effects of pheromones on southern pine beetle. Beetle populations could be aggregated using this pheromone. Gaumer and Gara (1967) investigated southern pine beetle development relative to phloem temperature and moisture. Coster (1967, 1970) and Coster and Gara (1968) continued research in the area to examine the effects of pheromones on the orientation of flying beetles, landing and boring activities, and the continuation and size of outbreaks. Lorio (1968) examined southern pine beetle activity and forest parameters and found that activity was correlated with soil type. Kalkstein (1976) conducted a study in BITH to examine the effects of climate stress on southern pine beetle outbreaks. He found that outbreaks and weather were correlated and successfully predicted an outbreak in 1973. Ragenovich (1977) discussed the southern pine beetle and infestations as they relate to each of the units in BITH. Maps and aerial observation were used to determine current status of infestation locations.

Oliveria and Spriggs (1982, 1989, 1990) conducted surveys of southern pine beetle infestations throughout the BITH. A possible suppression was proposed in 1982. By the later surveys, a suppression of pine beetles was recommended. Watson discussed longleaf pine ecology and procedures to reestablish longleaf pines in areas with dead trees from pine bark beetles. Bryant (1984) surveyed pine trees damaged by tornadoes for bark beetle infestation from winter 1983 through fall 1984. Southern pine beetle infestations also can have an effect on other species in the systems such as the RCW by threatening nest trees of this endangered species (Stafford 1992). Conner and Rudolph (1996) studied RCW populations in the Angelina National Forest, which is located north of the upper units of BITH. They examined the relationship between

RCWs and southern pine beetles, including population trends, loss of cavity trees, and infestation rates.

ANTHROPOGENIC DISTURBANCES

General

Zipp (1999) described the current and past anthropogenic threats that effect BITH including past logging and oil and gas operations, air and water pollution, alterations to flow and quality of rivers, fragmentation of habitat and the continued isolation of the individual park units, invasive non-indigenous species as well as the disruption of natural processes.

Possible stream diversions that would transfer water between basins have been proposed and would have an unknown effect on the park's natural resources (Harcombe & Callaway 1997b). Saltwater barriers have also been proposed along the Neches River and in Pine Island Bayou. They discussed the effects the barriers could have on resident species, habitat, and water quality.

Logging

Irwin and Dixon (1996) examined the effect of timber harvesting on the reptiles and amphibians of the Neches River bottomland hardwood forest. Preliminary data suggested that those amphibian species most affected by clearcutting may benefit from streamside management zones, although multiple factors (e.g., frequency of harvest, pattern, and extent) ultimately affect the conservation of the herpetofaunal community.

The 1996 RMP described the condition of natural resources in BITH and possible threats to these resources including logging, although most impacts were from past logging events (Strahan et al. 1996).

Exotic species

Harcombe (1996) discussed non-native mammals, including feral cats, dogs, and hog (*Sus scrofa*) as well as nutria, in the park that were competing with native species for food and habitat. Harcombe and Callaway (1997b) listed a number of exotics that are also of concern to the park including grass carp (*Ctenopharyngodon idella*), zebra mussels (*Dreissena polymorpha*), Chinese tallow tree, and water hyacinth (*Eichhorinia crassipes*). They discussed the effects these have on water corridors and suggested management actions.

In addition to the species listed by Harcombe (1996), the 1996 RMP also discussed the effects of the nine-banded armadillo (*Dasypus novemcinctus*), red imported fire ants (*Solenopsis invicta*), wasps and bees, cockroaches, silverfish, and slash pine.

Barrow et al. (1999) examined the effect of the increasingly abundant Chinese tallow on migrating landbirds. They found that at least 63 migratory birds used the forested areas before and after crossing the Gulf of Mexico. In forests with tallow, this species was used significantly less than expected. Siemann (2003) examined the effect of killing mature Chinese tallow trees on local seed production and seedling recruitment. They found an increase in native seedlings in the tree community in subsequent years on the treatment sites. Hartley et al. (2003) examined the role of insects in the invasive success of Chinese tallow. They compared the insect populations found on Chinese tallow and three native species and collected 1091 species of arthropods. They did not find definitive evidence that the tallow experienced a release from herbivory that gave the species a competitive advantage over the native species. Nijjer et al. (2003) examined the role of mycorrhizal fungi in forest dynamics. They examined fungal associations with Chinese tallow and native species to determine if these associations affected the invasion of the non-indigenous tallow into the area.

Off-road vehicles

In a study examining the effects of oil and gas exploration on local habitats, Fountain (1986b) and Fountain and Rayburn (1987) also conducted an investigation into disturbance caused by seismic survey vehicles. The extent of the damage varied according to the vegetation type, season, and type of equipment used. Although individual species appeared to recover relatively quickly, these disturbed areas were then more susceptible to disease. Duncan (1988) conducted a study to examine the effect of seismic exploration on the woody vegetation at BITH. Twenty-seven paired transects (impacted and control) were examined for differences in species abundance and composition, dominance, and basal area. There were variations between the paired transects for some of the parameters but overall there was no indication that the activity had an immediate impact on the woody vegetation.

Adjacent landuse impacts

Hydrologic changes, including dams and saltwater barriers have been studied to determine the cascading effects on the park's resources. McHugh (n.d.) described the erosion caused by salt-water barriers that were built to prevent a saltwater influx from downstream. Tilton (1986) discussed possible effects of the proposed Rockland Dam on inland fish and wildlife resources due to water level variations within the Neches River and floodplain. Harrel (1975) conducted a study examining water quality and saltwater intrusion in the lower Neches River. Samples were taken above (in the preserve) and below (both in and out of the preserve) the saltwater barriers. Saltwater intrusion occurs for up to half the year, during which time the organisms existing in the lower 58 km of the Neches and 5 km of the Pine Island Bayou, which are trapped behind the saltwater exclusion dams, die due to a decrease in oxygenated water.

Land management within the park and in the surrounding area has had an effect on BITH. Watson (1976b) described the effect of forestry and development on several units in the park including the loss of trees, damage to soil, increased nutrient load, and possible recovery time to return to a natural state. Hallmon (1976, 1977) described the effect the pine plantations in the area have had on the infestation of the southern pine beetle. He discussed how the salvage program of the Beech Creek unit created problems instead of solving them. Hughes et al. (1987) summarized the first two years of the monitoring study comparing data with results from previous studies conducted by non-NPS agencies. Water quality was examined to determine the effects of logging, exploration for fossil fuels, and development. Although general water quality was improving, there was some evidence of detrimental effects caused by exploration and development.

In their water corridor assessment, Harcombe and Callaway (1997b) discussed adjacent landuses that impact or could impact the park. These impacts included development (both residential and industrial), forestry operations and agriculture. They provided a detailed discussion of direct and indirect effects of these impacts on the park.

Rudolph et al. (1999) examined the effect of roads and vehicles on snake populations in the Big Thicket. Their data suggested that roads and traffic negatively affect snake populations in the area.

Oil and Gas Operations

A 1980 wilderness survey of BITH determined that with the current legislation allowing oil and gas well development none of the BITH units were eligible for wilderness classification (National Park Service 1980). However 5 of the 12 units could be appropriate in the future.

The effects of oil extraction and spills have been studied in the park. Fountain and Fletcher (1984) examined oil and gas drilling sites to determine the effect on the vegetation and soils at BITH. The report described the vegetation types and species found in the park and discussed the negligible long-term effect drilling had on the community. The only exception was when foreign materials, generally crushed shells, were used to stabilize soils. Fountain et al. (1986) found three major physical factors (foreign material, berms, and disruption of water flow) that inhibited regrowth of vegetation around abandoned oil well sites. They discussed methods of mollifying the sites and standards for future sites. In the final report examining the impact of oil and gas exploration on vegetation, Fountain (1986a) and Fountain and Rayburn (1987) discussed the recovery time for the surrounding environment. The time it took for an area to revert to its natural state was found to depend on the diversity of the environment (higher diversity, longer period) and the extent of the disturbance (foreign material and berms). Harrel (1985) conducted a study to determine effects of an oil spill in a creek bed in BITH. Six months after the spill, oligochaetes began to increase while chironomids decreased (and eventually disappeared). Although stream species slowly returned, those that indicate clean-water had not returned as of 26 months post-spill.

The 1996 RMP described the history of oil and gas extraction in BITH and discussed possible threats to the park's resources related to this activity (Strahan et al. 1996). As of 1996 there were 13 active operations in the park as well as two saltwater disposal sites, and six storage tank batteries. In addition to the more obvious threats posed by those activities (i.e., oil spills and contamination of water ways, etc.), they also addressed the impacts of access roads, increased brine, recovery of abandoned sites and waste disposal. The RMP also described a study that would survey vegetation on abandoned oil well pads.

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Appendix A. Federal and State Listed Species that have been documented in or are possible inhabitants of BITH. List of species was compiled from a number of the park's natural resource documents (Author unknown 2000; Big Thicket National Preserve 2004; Harcombe & Callaway 1997a; Strahan et al. 1996).

Species	**Scientific name**	**Status**
Plants		
Texas trailing phlox	*Phlox nivalis* spp. *texensis*	Federally and State Endangered
Navasota ladies'-tresses	*Spiranthes parksii*	Federally and State Endangered
Mammals		
red wolf	*Canis rufus*	Federally and State Endangered
Louisiana black bear	*Ursus americanus luteolus*	Federally and State Endangered
American black bear	*Ursus americanus*	Federally and State Threatened by similarity of appearance
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	Texas State Threatened
Reptiles		
Louisiana pine snake	*Pituophis ruthveni*	Texas State Threatened; Federal Candidate for Listing
alligator snapping turtle	*Macrochelys temmincki*	Texas State Threatened
timber (canebrake) rattlesnake	*Crotalus horridus*	Texas State Threatened
scarlet snake	*Cemophora coccinea*	Texas State Threatened
Texas scarlet snake	*Cemophora coccinea lineri*	Texas State Threatened
smooth green snake	*Liochlorophis vernalis*	Texas State Threatened
Amphibians		
Houston toad	*Bufo houstonensis*	Federally and State Endangered
Birds		
Wood Stork	*Mycteria americana*	Texas State Endangered
Brown Pelican	*Pelecanus occidentalis*	Texas State Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Federally Threatened (Proposed for delisting); Texas State Threatened
Eskimo Curlew	*Numenius borealis*	Federally and State Endangered
Ivory-billed Woodpecker	*Campephilus principalis*	Federally and State Endangered
Red-cockaded Woodpecker	*Picoides borealis*	Federally and State Endangered
Black-capped Vireo	*Vireo atricapillus*	Federally and State Endangered
Bachman's Warbler	*Vermivora bachmanii*	Federally and State Endangered
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Texas State Threatened
Piping Plover	*Charadrius melodus*	Federally and State Threatened
Reddish Egret	*Egretta rufenscens*	Texas State Threatened
White-faced Ibis	*Plegadis chihi*	Texas State Threatened
Bachman's Sparrow	*Aimophila aestivalis*	Texas State Threatened
American Swallow-tailed Kite	*Elanoides forficatus*	Texas State Threatened
American Peregrine Falcon	*Falco peregrinus anatum*	Texas State Endangered
Interior Least Tern	*Sterna antillarum athalassos*	Texas State Endangered
Whooping Crane	*Grus americana*	Federally and State Endangered

Appendix A. Continued.

Species	**Scientific name**	**Status**
Fish		
creek chubsucker	*Erimyzon oblongus*	Texas State Threatened
paddlefish	*Polyodon spathula*	Texas State Threatened
blue sucker	*Cycleptus elongatus*	Texas State Threatened
bluehead shiner	*Notropis hubbsi*	Texas State Threatened
river goby	*Awaous tajasica*	Texas State Threatened
Invertebrates		
American burying beetle	*Nicrophorus americanus*	Federally Endangered

Appendix B. Management issues and concerns that face BITH and how these issues may affect the park's resources

Management Issues	Priority	Significant Natural Resources Impacted	Monitoring Questions
Adjacent Landuse	HIGH	All	What are the impacts on Preserve resources resulting from development of adjacent lands? How is the increasing severity of habitat loss, isolation, and fragmentation affecting wildlife populations and migration patterns?
Air Quality (Compliance with Clean Air Act)	HIGH	All encompassing	Are Preserve resources being impacted by air-borne pollutants?
Climate Change	HIGH	Vegetation, wildlife	Is there sufficient long-term climactic monitoring data to warrant alarm; is there an immediate or impending threat of significant global climate change (global warming)?
Data Gaps	HIGH	Floral/faunal composition and assemblages.	What are BITH's inventory needs?
Erosion	HIGH	Water quality, hydrology, soils, riparian vegetation, wetlands, aquatic life	To what degree does erosion at BITH deviate from normal levels? Do feral hogs contribute to increased streamside erosion?
Exotics (Animals)	HIGH	Herbaceous vegetation (some T&E species), food/forage availability for native wildlife. Soil disturbance, disruption of hydrologic regime.	What is the nature and extent of damage to native species? Specifically, what impacts are feral hogs having on Preserve resources?
Exotics (Plants)	HIGH	Native vegetation, fauna reliant on mast.	What are the impacts of the encroachment of exotic species on native vegetative assemblages? How much wildlife habitat (particularly bottomland hardwood) has been lost or altered due to the spread of exotics?
Fire Management	HIGH	Fire dependant ecosystems	Are prescribed burns having the desired effect on fire dependent systems?
Floodplain protection	HIGH	Hydrology, bottomland forests, aquatic organisms, wildlife	How are Preserve resources impacted by unnatural flood regimes? To what extent has exotic vegetation (namely Chinese tallow) altered the composition of floodplain hardwood forests.
Forest pests/Diseases	HIGH	Forest/stand health and composition	
Hunting & Trapping	HIGH	Native game animal populations, natural quiet.	What are the population dynamics of BITH game animals
Migratory Birds	HIGH	Migratory birds and associated habitats	Have habitat loss and isolation outside the Preserve altered migratory bird habits/habitat utilization?
Native Pests	HIGH	Pine forests and associated wildlife.	Are conditions ripe for a SPB outbreak in east Texas?
Native Species Overpopulation	HIGH	Vegetation, water quality, wildlife.	Does yaupon (*Ilex vomitoria*) exist at an unnaturally high concentration? Is native species particularly mammalian) overpopulation having a negative impact on BITH resources?

Appendix B. Continued

Management Issues	Priority	Significant Natural Resources Impacted	Monitoring Questions
Native Vegetation Restoration	HIGH	Native plant and wildlife populations	How effective have past restoration efforts been in recreating natural habitats? What areas of the Preserve are best suited for future restoration attempts?
Non-NPS/ Inholding Issues	HIGH	Water quality, vegetation, wildlife, scenic properties	Are "houseboats", essentially floating shacks, having a negative impact to Neches River water quality?
Oil/Gas	HIGH	All	
Outside Development	HIGH	Same as adjacent landuse	What are the impacts on Preserve resources resulting from development of adjacent lands? How is the increasing severity of habitat loss, isolation, and fragmentation affecting wildlife populations and migration patterns?
Poaching	HIGH	Game and non-game animals.	To what extent are wildlife populations in and around the Preserve being affected by illegal harvests?
Right-of-ways/Easements	HIGH	Changes in vegetation community structure, wetlands, exotics	How are ROW's (pipelines) adversely affecting the Preserve?
Soundscape	HIGH	Wildlife, natural quiet	Is off-preserve noises (highways, overflights, O&G, etc.) disrupting natural systems? If so, to what degree?
T&E Species	HIGH	T&E species and associated habitats	Has the Preserve been extensively surveyed for the presence of T&E species? What changes to monitoring protocol are needed? Does the Louisiana Pine Snake occur on BITH lands?
Water Quality (Ground)	HIGH	Groundwater, springs, seeps	What effects are Oil and Gas activities in and near the Preserve having on BITH groundwater?
Water Quality (Surface) (Compliance with Clean Water Act)	HIGH	All encompassing	Are Preserve waters in compliance with CWA? What are the major point source polluters to Preserve waters? What pollutants are responsible for degradation of BITH watersheds?
Water Quantity (Surface Water)	HIGH	Bottomland Hardwood forests and inhabitants	What effects are reservoir-related activities (altered flood regimes) having on the bottomland hardwood forests along the Neches River Corridor
Wetlands	HIGH	Water quality, aquatic organisms and amphibians, wildlife.	How "healthy" are BITH wetlands? How can we bolster our monitoring activities? Are any wetlands in need of restoration?
Fishing (Rec & Comm)	MED	Sport and other fish species	Are certain species of fish being over-harvested?
Native Wildlife Reintroductions	MED	Native wildlife	Does BITH have sufficient suitable habitat to entertain repatriating extirpated/rare wildlife (RCW, Louisiana black bear)?
Subsidence	MED	Wetlands, water quality, wildlife	Is this an issue at BITH?
Water Quantity (Groundwater)	MED	No information	No information
With/In Park Development	MED	Vegetation, wildlife, viewshed,	Is in-park development having an impact on Preserve resources?

Appendix B. Continued.

Management Issues	Priority	Significant Natural Resources Impacted	Monitoring Questions
Limited visitation	LOW	Wildlife, vegetation	Does visitations appreciably impact Preserve resources?
Adjacent Landuse	NA	NA	NA
Genetic Contamination	NA	NA	NA
Mining	NA	NA	NA
Night Sky	NA	NA	NA
Slope Failure	NA	NA	NA
Viewscape	NA	NA	NA

GIS DATA, DATASETS

A list of available spatial and non-spatial data is provided for the park. Data have been organized into the following groups: GIS data, non-GIS digital maps, hardcopy maps, digital databases, digital publications, NatureBib maps, and abbreviations. GIS data have been further separated into three categories: park specific or local, statewide, and nation-wide. A unique identifier has been given to each line of data as follows: "X_#", where "X" is a letter describing the data type (L=local GIS, C=Coastal, S=Statewide GIS, N= Nationwide GIS, D=database, and P=publication) and "#" is a unique number. Basic information is provided to allow quick review of the publicly available data, including the title of the data and the organization from which the data are available. To view more extensive details about the data, an EXCEL workbook ("Digital Data") has been provided. The EXCEL workbook includes several datasheets for each of the aforementioned data categories. Among some of the additional details provided in the EXCEL workbook are partial metadata, web addresses, and descriptions of the data. Blank fields within the EXCEL workbook represent information that were not readily available, but can be gathered at a later date with a more in depth search of the available metadata.

General Park Information

Zip Code	77625 Kountze, TX

Spatial Extent

Lat	Long
30.80	-94.85
30.16	-94.05

Park divided into 7 distinct units

Unit	Name
1	Big Sandy Creek and Menard Creek Corridor Units
2	Loblolly Unit
3	Lance Rosier, Pine Island-Little Pine Island Bayou Corridor, Beaumont, Upper and Lower Neches River, and Neches Bottom-Jack Gore Units
4	Beech Creek Unit
5	Turkey Creek Unit
6	Un-named just west of Turkey Creek Unit
7	Hickory Creek Savannah Unit

Containing Park Boundaries

Quadrangles	Unit	Counties
Town Bluff	3 & 4	Polk
Dallardsville	1	Liberty
Spurger	3 & 4	Hardin
Magnolia Springs	3	Tyler
Warren	7	Jasper
Hicksbaugh	5	Orange
Fred	3	San Jacinto
Potato Patch Lake	3	Jefferson
Segno	1	
Romayor	1	
Deserter Baygall	3	
Franklin Lake	3	
Votaw	1	
Village Mills	6	
Kountze North	5	
Arizona Creek	2	
Saratoga	3	
Kountze SW	3	
Kountze South	3	
Evadale	3	
Thorson Gully	3	
Sour Lake	3	
Bevil Oaks	3	
Voth	3	
Pine Forest	3	

General Park Information

Area in Between and Surrounding Park Boundaries

Quadrangles	Counties
Beech Grove	Polk
Schwab City	Hardin
Jacks Creek South	Tyler
Bragg	Jasper
Silsbee	

Counties	Unit
Polk	1
Liberty	1,2
Hardin	1,3,5,6
Tyler	3,4,5,7
Jasper	3
Orange	3
San Jacinto	1
Jefferson	3

Watersheds	HUC	Unit
Village	12020006	1,3,4,5,6,7
Lower Trinity-Kickapoo	12030202	1
Pine Island Bayou	12020007	2,3
Lower Neches	12020003	3

Soil data available for all counties except Tyler

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
Big Sandy Creek and Menard Creek Corridor Units							
L_1	TNRIS	USGS	Dallardsville NE	DOQQ	1:12,000	Raster	1 m
L_2	TNRIS	USGS	Dallardsville NE	DOQQ	1:12,000	Raster	2.5 m
L_3	TNRIS	USGS	Dallardsville NE	DOQQ	1:12,000	Raster	10 m
L_4	TNRIS	USGS	Dallardsville NE	DOQQ	1:12,000	Raster	30 m
L_5	TNRIS	USGS	Dallardsville NW	DOQQ	1:12,000	Raster	1 m
L_6	TNRIS	USGS	Dallardsville NW	DOQQ	1:12,000	Raster	2.5 m
L_7	TNRIS	USGS	Dallardsville NW	DOQQ	1:12,000	Raster	10 m
L_8	TNRIS	USGS	Dallardsville NW	DOQQ	1:12,000	Raster	30 m
L_9	TNRIS	USGS	Dallardsville SE	DOQQ	1:12,000	Raster	1 m
L_10	TNRIS	USGS	Dallardsville SE	DOQQ	1:12,000	Raster	2.5 m
L_11	TNRIS	USGS	Dallardsville SE	DOQQ	1:12,000	Raster	10 m
L_12	TNRIS	USGS	Dallardsville SE	DOQQ	1:12,000	Raster	30 m
L_13	TNRIS	USGS	Dallardsville SW	DOQQ	1:12,000	Raster	1 m
L_14	TNRIS	USGS	Dallardsville SW	DOQQ	1:12,000	Raster	2.5 m
L_15	TNRIS	USGS	Dallardsville SW	DOQQ	1:12,000	Raster	10 m
L_16	TNRIS	USGS	Dallardsville SW	DOQQ	1:12,000	Raster	30 m
L_17	TNRIS	USGS	Dallardsville	DRG	1:24,000	Vector	
L_18	TNRIS	USGS	Dallardsville	DRG	1:100,000	Vector	
L_19	TNRIS	USGS	Dallardsville	DRG	1:250,000	Vector	
L_20	TNRIS	USGS	Dallardsville	Hypsography	1:24,000	Vector	
L_21	TNRIS	USGS	Dallardsville	DEM	1:24,000	Raster	30 m
L_22	TNRIS	USGS	Romayor NE	DOQQ	1:12,000	Raster	1 m
L_23	TNRIS	USGS	Romayor NE	DOQQ	1:12,000	Raster	2.5 m
L_24	TNRIS	USGS	Romayor NE	DOQQ	1:12,000	Raster	10 m
L_25	TNRIS	USGS	Romayor NE	DOQQ	1:12,000	Raster	30 m
L_26	TNRIS	USGS	Romayor NW	DOQQ	1:12,000	Raster	1 m
L_27	TNRIS	USGS	Romayor NW	DOQQ	1:12,000	Raster	2.5 m
L_28	TNRIS	USGS	Romayor NW	DOQQ	1:12,000	Raster	10 m
L_29	TNRIS	USGS	Romayor NW	DOQQ	1:12,000	Raster	30 m
L_30	TNRIS	USGS	Romayor SE	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_31	TNRIS	USGS	Romayor SE	DOQQ	1:12,000	Raster	2.5 m
L_32	TNRIS	USGS	Romayor SE	DOQQ	1:12,000	Raster	10 m
L_33	TNRIS	USGS	Romayor SE	DOQQ	1:12,000	Raster	30 m
L_34	TNRIS	USGS	Romayor SW	DOQQ	1:12,000	Raster	1 m
L_35	TNRIS	USGS	Romayor SW	DOQQ	1:12,000	Raster	2.5 m
L_36	TNRIS	USGS	Romayor SW	DOQQ	1:12,000	Raster	10 m
L_37	TNRIS	USGS	Romayor SW	DOQQ	1:12,000	Raster	30 m
L_38	TNRIS	USGS	Romayor	DRG	1:24,000	Vector	
L_39	TNRIS	USGS	Romayor	DRG	1:100,000	Vector	
L_40	TNRIS	USGS	Romayor	DRG	1:250,000	Vector	
L_41	TNRIS	USGS	Romayor	Hypsography	1:24,000	Vector	
L_42	TNRIS	USGS	Romayor	DEM	1:24,000	Raster	30 m
L_43	TNRIS	USGS	Segno NE	DOQQ	1:12,000	Raster	1 m
L_44	TNRIS	USGS	Segno NE	DOQQ	1:12,000	Raster	2.5 m
L_45	TNRIS	USGS	Segno NE	DOQQ	1:12,000	Raster	10 m
L_46	TNRIS	USGS	Segno NE	DOQQ	1:12,000	Raster	30 m
L_47	TNRIS	USGS	Segno NW	DOQQ	1:12,000	Raster	1 m
L_48	TNRIS	USGS	Segno NW	DOQQ	1:12,000	Raster	2.5 m
L_49	TNRIS	USGS	Segno NW	DOQQ	1:12,000	Raster	10 m
L_50	TNRIS	USGS	Segno NW	DOQQ	1:12,000	Raster	30 m
L_51	TNRIS	USGS	Segno SE	DOQQ	1:12,000	Raster	1 m
L_52	TNRIS	USGS	Segno SE	DOQQ	1:12,000	Raster	2.5 m
L_53	TNRIS	USGS	Segno SE	DOQQ	1:12,000	Raster	10 m
L_54	TNRIS	USGS	Segno SE	DOQQ	1:12,000	Raster	30 m
L_55	TNRIS	USGS	Segno SW	DOQQ	1:12,000	Raster	1 m
L_56	TNRIS	USGS	Segno SW	DOQQ	1:12,000	Raster	2.5 m
L_57	TNRIS	USGS	Segno SW	DOQQ	1:12,000	Raster	10 m
L_58	TNRIS	USGS	Segno SW	DOQQ	1:12,000	Raster	30 m
L_59	TNRIS	USGS	Segno	DRG	1:24,000	Vector	
L_60	TNRIS	USGS	Segno	DRG	1:100,000	Vector	
L_61	TNRIS	USGS	Segno	DRG	1:250,000	Vector	
L_62	TNRIS	USGS	Segno	Hypsography	1:24,000	Vector	

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_63	TNRIS	USGS	Segno	DEM	1:24,000	Raster	30 m
L_64	TNRIS	USGS	Votaw NE	DOQQ	1:12,000	Raster	1 m
L_65	TNRIS	USGS	Votaw NE	DOQQ	1:12,000	Raster	2.5 m
L_66	TNRIS	USGS	Votaw NE	DOQQ	1:12,000	Raster	10 m
L_67	TNRIS	USGS	Votaw NE	DOQQ	1:12,000	Raster	30 m
L_68	TNRIS	USGS	Votaw NW	DOQQ	1:12,000	Raster	1 m
L_69	TNRIS	USGS	Votaw NW	DOQQ	1:12,000	Raster	2.5 m
L_70	TNRIS	USGS	Votaw NW	DOQQ	1:12,000	Raster	10 m
L_71	TNRIS	USGS	Votaw NW	DOQQ	1:12,000	Raster	30 m
L_72	TNRIS	USGS	Votaw SE	DOQQ	1:12,000	Raster	1 m
L_73	TNRIS	USGS	Votaw SE	DOQQ	1:12,000	Raster	2.5 m
L_74	TNRIS	USGS	Votaw SE	DOQQ	1:12,000	Raster	10 m
L_75	TNRIS	USGS	Votaw SE	DOQQ	1:12,000	Raster	30 m
L_76	TNRIS	USGS	Votaw SW	DOQQ	1:12,000	Raster	1 m
L_77	TNRIS	USGS	Votaw SW	DOQQ	1:12,000	Raster	2.5 m
L_78	TNRIS	USGS	Votaw SW	DOQQ	1:12,000	Raster	10 m
L_79	TNRIS	USGS	Votaw SW	DOQQ	1:12,000	Raster	30 m
L_80	TNRIS	USGS	Votaw	DRG	1:24,000	Vector	
L_81	TNRIS	USGS	Votaw	DRG	1:100,000	Vector	
L_82	TNRIS	USGS	Votaw	DRG	1:250,000	Vector	
L_83	TNRIS	USGS	Votaw	Hypsography	1:24,000	Vector	
L_84	TNRIS	USGS	Votaw	DEM	1:24,000	Raster	30 m
L_85	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_86	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_87	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_88	TNRIS		Liberty County	DOQ Mosaic	1:12,000	Raster	1 m
L_89	TNRIS		Polk County	DOQ Mosaic	1:12,000	Raster	1 m
L_90	TNRIS		San Jacinto County	DOQ Mosaic	1:12,000	Raster	1 m
L_91	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_92	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_93	USGS	USGS	Lower Trinity-Kickapoo Watershed	NHD	1:100,000	Vector	

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_94	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_95	RRC	RRC	Hardin County	Pipeline and Well			
L_96	RRC	RRC	Liberty County	Pipeline and Well			
L_97	RRC	RRC	Polk County	Pipeline and Well			
L_98	RRC	RRC	San Jacinto County	Pipeline and Well			
L_99	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_100	TNRIS/NRCS	NRCS	Liberty County	Soil	1:24,000	Vector	1 m
L_101	TNRIS/NRCS	NRCS	Polk County	Soil	1:24,000	Vector	1 m
L_102	TNRIS/NRCS	NRCS	San Jacinto County	Soil	1:24,000	Vector	1 m
L_103	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
L_104	TNRIS	TxDOT	Liberty County	Transportation Urban		Vector	
L_105	TNRIS	TxDOT	Polk County	Transportation Urban		Vector	
L_106	TNRIS	TxDOT	San Jacinto County	Transportation Urban		Vector	
Loblolly Unit							
L_107	TNRIS	USGS	Arizona Creek NW	DOQQ	1:12,000	Raster	1 m
L_108	TNRIS	USGS	Arizona Creek NE	DOQQ	1:12,000	Raster	1 m
L_109	TNRIS	USGS	Arizona Creek SW	DOQQ	1:12,000	Raster	1 m
L_110	TNRIS	USGS	Arizona Creek SE	DOQQ	1:12,000	Raster	1 m
L_111	TNRIS	USGS	Arizona Creek NW	DOQQ	1:12,000	Raster	2.5 m
L_112	TNRIS	USGS	Arizona Creek NE	DOQQ	1:12,000	Raster	2.5 m
L_113	TNRIS	USGS	Arizona Creek SW	DOQQ	1:12,000	Raster	2.5 m
L_114	TNRIS	USGS	Arizona Creek SE	DOQQ	1:12,000	Raster	2.5 m
L_115	TNRIS	USGS	Arizona Creek NW	DOQQ	1:12,000	Raster	10 m
L_116	TNRIS	USGS	Arizona Creek NE	DOQQ	1:12,000	Raster	10 m
L_117	TNRIS	USGS	Arizona Creek SW	DOQQ	1:12,000	Raster	10 m
L_118	TNRIS	USGS	Arizona Creek SE	DOQQ	1:12,000	Raster	10 m
L_119	TNRIS	USGS	Arizona Creek NW	DOQQ	1:12,000	Raster	30 m
L_120	TNRIS	USGS	Arizona Creek NE	DOQQ	1:12,000	Raster	30 m
L_121	TNRIS	USGS	Arizona Creek SW	DOQQ	1:12,000	Raster	30 m
L_122	TNRIS	USGS	Arizona Creek SE	DOQQ	1:12,000	Raster	30 m
L_123	TNRIS	USGS	Arizona Creek	DRG	1:24,000	Vector	

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
L_124	TNRIS	USGS	Arizona Creek	DRG	1:100,000	Vector	
L_125	TNRIS	USGS	Arizona Creek	DRG	1:250,000	Vector	
L_126	TNRIS	USGS	Arizona Creek	Hypsography	1:24,000	Vector	
L_127	TNRIS	USGS	Arizona Creek	DEM	1:24,000	Raster	30 m
L_128	TNRIS		Liberty County	DOQ Mosaic	1:12,000	Raster	1 m
L_129	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_130	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_131	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_132	USGS	USGS	Pine Island Bayou Watershed	NHD	1:100,000	Vector	
L_133	RRC	RRC	Liberty County	Pipeline and Well			
L_134	RRC	RRC	Hardin County	Pipeline and Well			
L_135	TNRIS/NRCS	NRCS	Liberty County	Soil	1:24,000	Vector	1 m
L_136	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_137	TNRIS	TxDOT	Liberty County	Transportation Urban		Vector	
L_138	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
Lance Rosier, Pine Island-Little Pine Island Bayou Corridor, Beaumont, Upper and Lower Neches River, and Neches Bottom-Jack Gore Units							
L_139	TNRIS	USGS	Bevil Oaks NE	DOQQ	1:12,000	Raster	1 m
L_140	TNRIS	USGS	Bevil Oaks NE	DOQQ	1:12,000	Raster	2.5 m
L_141	TNRIS	USGS	Bevil Oaks NE	DOQQ	1:12,000	Raster	10 m
L_142	TNRIS	USGS	Bevil Oaks NE	DOQQ	1:12,000	Raster	30 m
L_143	TNRIS	USGS	Bevil Oaks NW	DOQQ	1:12,000	Raster	1 m
L_144	TNRIS	USGS	Bevil Oaks NW	DOQQ	1:12,000	Raster	2.5 m
L_145	TNRIS	USGS	Bevil Oaks NW	DOQQ	1:12,000	Raster	10 m
L_146	TNRIS	USGS	Bevil Oaks NW	DOQQ	1:12,000	Raster	30 m
L_147	TNRIS	USGS	Bevil Oaks SE	DOQQ	1:12,000	Raster	1 m
L_148	TNRIS	USGS	Bevil Oaks SE	DOQQ	1:12,000	Raster	2.5 m
L_149	TNRIS	USGS	Bevil Oaks SE	DOQQ	1:12,000	Raster	10 m
L_150	TNRIS	USGS	Bevil Oaks SE	DOQQ	1:12,000	Raster	30 m
L_151	TNRIS	USGS	Bevil Oaks SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
ID	**Available From**	**Originator/ Publisher**	**Location**	**Data**	**Scale**	**Structure**	**Resolution**
L_152	TNRIS	USGS	Bevil Oaks SW	DOQQ	1:12,000	Raster	2.5 m
L_153	TNRIS	USGS	Bevil Oaks SW	DOQQ	1:12,000	Raster	10 m
L_154	TNRIS	USGS	Bevil Oaks SW	DOQQ	1:12,000	Raster	30 m
L_155	TNRIS	USGS	Bevil Oaks	DEM	1:24,000	Raster	30 m
L_156	TNRIS	USGS	Bevil Oaks	DRG	1:24,000	Vector	
L_157	TNRIS	USGS	Bevil Oaks	DRG	1:100,000	Vector	
L_158	TNRIS	USGS	Bevil Oaks	DRG	1:250,000	Vector	
L_159	TNRIS	USGS	Bevil Oaks	Hypsography	1:24,000	Vector	
L_160	TNRIS	USGS	Deserter Baygall NE	DOQQ	1:12,000	Raster	1 m
L_161	TNRIS	USGS	Deserter Baygall NE	DOQQ	1:12,000	Raster	2.5 m
L_162	TNRIS	USGS	Deserter Baygall NE	DOQQ	1:12,000	Raster	10 m
L_163	TNRIS	USGS	Deserter Baygall NE	DOQQ	1:12,000	Raster	30 m
L_164	TNRIS	USGS	Deserter Baygall NW	DOQQ	1:12,000	Raster	1 m
L_165	TNRIS	USGS	Deserter Baygall NW	DOQQ	1:12,000	Raster	2.5 m
L_166	TNRIS	USGS	Deserter Baygall NW	DOQQ	1:12,000	Raster	10 m
L_167	TNRIS	USGS	Deserter Baygall NW	DOQQ	1:12,000	Raster	30 m
L_168	TNRIS	USGS	Deserter Baygall SE	DOQQ	1:12,000	Raster	1 m
L_169	TNRIS	USGS	Deserter Baygall SE	DOQQ	1:12,000	Raster	2.5 m
L_170	TNRIS	USGS	Deserter Baygall SE	DOQQ	1:12,000	Raster	10 m
L_171	TNRIS	USGS	Deserter Baygall SE	DOQQ	1:12,000	Raster	30 m
L_172	TNRIS	USGS	Deserter Baygall SW	DOQQ	1:12,000	Raster	1 m
L_173	TNRIS	USGS	Deserter Baygall SW	DOQQ	1:12,000	Raster	2.5 m
L_174	TNRIS	USGS	Deserter Baygall SW	DOQQ	1:12,000	Raster	10 m
L_175	TNRIS	USGS	Deserter Baygall SW	DOQQ	1:12,000	Raster	30 m
L_176	TNRIS	USGS	Deserter Baygall	DEM	1:24,000	Raster	30 m
L_177	TNRIS	USGS	Deserter Baygall	DRG	1:24,000	Vector	
L_178	TNRIS	USGS	Deserter Baygall	DRG	1:100,000	Vector	
L_179	TNRIS	USGS	Deserter Baygall	DRG	1:250,000	Vector	
L_180	TNRIS	USGS	Deserter Baygall	Hypsography	1:24,000	Vector	
L_181	TNRIS	USGS	Evadale NE	DOQQ	1:12,000	Raster	1 m
L_182	TNRIS	USGS	Evadale NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_183	TNRIS	USGS	Evadale NE	DOQQ	1:12,000	Raster	10 m
L_184	TNRIS	USGS	Evadale NE	DOQQ	1:12,000	Raster	30 m
L_185	TNRIS	USGS	Evadale NW	DOQQ	1:12,000	Raster	1 m
L_186	TNRIS	USGS	Evadale NW	DOQQ	1:12,000	Raster	2.5 m
L_187	TNRIS	USGS	Evadale NW	DOQQ	1:12,000	Raster	10 m
L_188	TNRIS	USGS	Evadale NW	DOQQ	1:12,000	Raster	30 m
L_189	TNRIS	USGS	Evadale SE	DOQQ	1:12,000	Raster	1 m
L_190	TNRIS	USGS	Evadale SE	DOQQ	1:12,000	Raster	2.5 m
L_191	TNRIS	USGS	Evadale SE	DOQQ	1:12,000	Raster	10 m
L_192	TNRIS	USGS	Evadale SE	DOQQ	1:12,000	Raster	30 m
L_193	TNRIS	USGS	Evadale SW	DOQQ	1:12,000	Raster	1 m
L_194	TNRIS	USGS	Evadale SW	DOQQ	1:12,000	Raster	2.5 m
L_195	TNRIS	USGS	Evadale SW	DOQQ	1:12,000	Raster	10 m
L_196	TNRIS	USGS	Evadale SW	DOQQ	1:12,000	Raster	30 m
L_197	TNRIS	USGS	Evadale	DEM	1:24,000	Raster	30 m
L_198	TNRIS	USGS	Evadale	DRG	1:24,000	Vector	
L_199	TNRIS	USGS	Evadale	DRG	1:100,000	Vector	
L_200	TNRIS	USGS	Evadale	DRG	1:250,000	Vector	
L_201	TNRIS	USGS	Evadale	Hypsography	1:24,000	Vector	
L_202	TNRIS	USGS	Franklin Lake NE	DOQQ	1:12,000	Raster	1 m
L_203	TNRIS	USGS	Franklin Lake NE	DOQQ	1:12,000	Raster	2.5 m
L_204	TNRIS	USGS	Franklin Lake NE	DOQQ	1:12,000	Raster	10 m
L_205	TNRIS	USGS	Franklin Lake NE	DOQQ	1:12,000	Raster	30 m
L_206	TNRIS	USGS	Franklin Lake NW	DOQQ	1:12,000	Raster	1 m
L_207	TNRIS	USGS	Franklin Lake NW	DOQQ	1:12,000	Raster	2.5 m
L_208	TNRIS	USGS	Franklin Lake NW	DOQQ	1:12,000	Raster	10 m
L_209	TNRIS	USGS	Franklin Lake NW	DOQQ	1:12,000	Raster	30 m
L_210	TNRIS	USGS	Franklin Lake SE	DOQQ	1:12,000	Raster	1 m
L_211	TNRIS	USGS	Franklin Lake SE	DOQQ	1:12,000	Raster	2.5 m
L_212	TNRIS	USGS	Franklin Lake SE	DOQQ	1:12,000	Raster	10 m
L_213	TNRIS	USGS	Franklin Lake SE	DOQQ	1:12,000	Raster	30 m
L_214	TNRIS	USGS	Franklin Lake SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_215	TNRIS	USGS	Franklin Lake SW	DOQQ	1:12,000	Raster	2.5 m
L_216	TNRIS	USGS	Franklin Lake SW	DOQQ	1:12,000	Raster	10 m
L_217	TNRIS	USGS	Franklin Lake SW	DOQQ	1:12,000	Raster	30 m
L_218	TNRIS	USGS	Franklin Lake	DEM	1:24,000	Raster	30 m
L_219	TNRIS	USGS	Franklin Lake	DRG	1:24,000	Vector	
L_220	TNRIS	USGS	Franklin Lake	DRG	1:100,000	Vector	
L_221	TNRIS	USGS	Franklin Lake	DRG	1:250,000	Vector	
L_222	TNRIS	USGS	Franklin Lake	Hypsography	1:24,000	Vector	
L_223	TNRIS	USGS	Fred NE	DOQQ	1:12,000	Raster	1 m
L_224	TNRIS	USGS	Fred NE	DOQQ	1:12,000	Raster	2.5 m
L_225	TNRIS	USGS	Fred NE	DOQQ	1:12,000	Raster	10 m
L_226	TNRIS	USGS	Fred NE	DOQQ	1:12,000	Raster	30 m
L_227	TNRIS	USGS	Fred NW	DOQQ	1:12,000	Raster	1 m
L_228	TNRIS	USGS	Fred NW	DOQQ	1:12,000	Raster	2.5 m
L_229	TNRIS	USGS	Fred NW	DOQQ	1:12,000	Raster	10 m
L_230	TNRIS	USGS	Fred NW	DOQQ	1:12,000	Raster	30 m
L_231	TNRIS	USGS	Fred SE	DOQQ	1:12,000	Raster	1 m
L_232	TNRIS	USGS	Fred SE	DOQQ	1:12,000	Raster	2.5 m
L_233	TNRIS	USGS	Fred SE	DOQQ	1:12,000	Raster	10 m
L_234	TNRIS	USGS	Fred SE	DOQQ	1:12,000	Raster	30 m
L_235	TNRIS	USGS	Fred SW	DOQQ	1:12,000	Raster	1 m
L_236	TNRIS	USGS	Fred SW	DOQQ	1:12,000	Raster	2.5 m
L_237	TNRIS	USGS	Fred SW	DOQQ	1:12,000	Raster	10 m
L_238	TNRIS	USGS	Fred SW	DOQQ	1:12,000	Raster	30 m
L_239	TNRIS	USGS	Fred	DEM	1:24,000	Raster	30 m
L_240	TNRIS	USGS	Fred	DRG	1:24,000	Vector	
L_241	TNRIS	USGS	Fred	DRG	1:100,000	Vector	
L_242	TNRIS	USGS	Fred	DRG	1:250,000	Vector	
L_243	TNRIS	USGS	Fred	Hypsography	1:24,000	Vector	
L_244	TNRIS	USGS	Kountze South NE	DOQQ	1:12,000	Raster	1 m
L_245	TNRIS	USGS	Kountze South NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_246	TNRIS	USGS	Kountze South NE	DOQQ	1:12,000	Raster	10 m
L_247	TNRIS	USGS	Kountze South NE	DOQQ	1:12,000	Raster	30 m
L_248	TNRIS	USGS	Kountze South NW	DOQQ	1:12,000	Raster	1 m
L_249	TNRIS	USGS	Kountze South NW	DOQQ	1:12,000	Raster	2.5 m
L_250	TNRIS	USGS	Kountze South NW	DOQQ	1:12,000	Raster	10 m
L_251	TNRIS	USGS	Kountze South NW	DOQQ	1:12,000	Raster	30 m
L_252	TNRIS	USGS	Kountze South SE	DOQQ	1:12,000	Raster	1 m
L_253	TNRIS	USGS	Kountze South SE	DOQQ	1:12,000	Raster	2.5 m
L_254	TNRIS	USGS	Kountze South SE	DOQQ	1:12,000	Raster	10 m
L_255	TNRIS	USGS	Kountze South SE	DOQQ	1:12,000	Raster	30 m
L_256	TNRIS	USGS	Kountze South SW	DOQQ	1:12,000	Raster	1 m
L_257	TNRIS	USGS	Kountze South SW	DOQQ	1:12,000	Raster	2.5 m
L_258	TNRIS	USGS	Kountze South SW	DOQQ	1:12,000	Raster	10 m
L_259	TNRIS	USGS	Kountze South SW	DOQQ	1:12,000	Raster	30 m
L_260	TNRIS	USGS	Kountze South	DEM	1:24,000	Raster	30 m
L_261	TNRIS	USGS	Kountze South	DRG	1:24,000	Vector	
L_262	TNRIS	USGS	Kountze South	DRG	1:100,000	Vector	
L_263	TNRIS	USGS	Kountze South	DRG	1:250,000	Vector	
L_264	TNRIS	USGS	Kountze South	Hypsography	1:24,000	Vector	
L_265	TNRIS	USGS	Kountze SW NE	DOQQ	1:12,000	Raster	1 m
L_266	TNRIS	USGS	Kountze SW NE	DOQQ	1:12,000	Raster	2.5 m
L_267	TNRIS	USGS	Kountze SW NE	DOQQ	1:12,000	Raster	10 m
L_268	TNRIS	USGS	Kountze SW NE	DOQQ	1:12,000	Raster	30 m
L_269	TNRIS	USGS	Kountze SW NW	DOQQ	1:12,000	Raster	1 m
L_270	TNRIS	USGS	Kountze SW NW	DOQQ	1:12,000	Raster	2.5 m
L_271	TNRIS	USGS	Kountze SW NW	DOQQ	1:12,000	Raster	10 m
L_272	TNRIS	USGS	Kountze SW NW	DOQQ	1:12,000	Raster	30 m
L_273	TNRIS	USGS	Kountze SW SE	DOQQ	1:12,000	Raster	1 m
L_274	TNRIS	USGS	Kountze SW SE	DOQQ	1:12,000	Raster	2.5 m
L_275	TNRIS	USGS	Kountze SW SE	DOQQ	1:12,000	Raster	10 m
L_276	TNRIS	USGS	Kountze SW SE	DOQQ	1:12,000	Raster	30 m
L_277	TNRIS	USGS	Kountze SW SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_278	TNRIS	USGS	Kountze SW SW	DOQQ	1:12,000	Raster	2.5 m
L_279	TNRIS	USGS	Kountze SW SW	DOQQ	1:12,000	Raster	10 m
L_280	TNRIS	USGS	Kountze SW SW	DOQQ	1:12,000	Raster	30 m
L_281	TNRIS	USGS	Kountze SW	DEM	1:24,000	Raster	30 m
L_282	TNRIS	USGS	Kountze SW	DRG	1:24,000	Vector	
L_283	TNRIS	USGS	Kountze SW	DRG	1:100,000	Vector	
L_284	TNRIS	USGS	Kountze SW	DRG	1:250,000	Vector	
L_285	TNRIS	USGS	Kountze SW	Hypsography	1:24,000	Vector	
L_286	TNRIS	USGS	Magnolia Springs NE	DOQQ	1:12,000	Raster	1 m
L_287	TNRIS	USGS	Magnolia Springs NE	DOQQ	1:12,000	Raster	2.5 m
L_288	TNRIS	USGS	Magnolia Springs NE	DOQQ	1:12,000	Raster	10 m
L_289	TNRIS	USGS	Magnolia Springs NE	DOQQ	1:12,000	Raster	30 m
L_290	TNRIS	USGS	Magnolia Springs NW	DOQQ	1:12,000	Raster	1 m
L_291	TNRIS	USGS	Magnolia Springs NW	DOQQ	1:12,000	Raster	2.5 m
L_292	TNRIS	USGS	Magnolia Springs NW	DOQQ	1:12,000	Raster	10 m
L_293	TNRIS	USGS	Magnolia Springs NW	DOQQ	1:12,000	Raster	30 m
L_294	TNRIS	USGS	Magnolia Springs SE	DOQQ	1:12,000	Raster	1 m
L_295	TNRIS	USGS	Magnolia Springs SE	DOQQ	1:12,000	Raster	2.5 m
L_296	TNRIS	USGS	Magnolia Springs SE	DOQQ	1:12,000	Raster	10 m
L_297	TNRIS	USGS	Magnolia Springs SE	DOQQ	1:12,000	Raster	30 m
L_298	TNRIS	USGS	Magnolia Springs SW	DOQQ	1:12,000	Raster	1 m
L_299	TNRIS	USGS	Magnolia Springs SW	DOQQ	1:12,000	Raster	2.5 m
L_300	TNRIS	USGS	Magnolia Springs SW	DOQQ	1:12,000	Raster	10 m
L_301	TNRIS	USGS	Magnolia Springs SW	DOQQ	1:12,000	Raster	30 m
L_302	TNRIS	USGS	Magnolia Springs	DEM	1:24,000	Raster	30 m
L_303	TNRIS	USGS	Magnolia Springs	DRG	1:24,000	Vector	
L_304	TNRIS	USGS	Magnolia Springs	DRG	1:100,000	Vector	
L_305	TNRIS	USGS	Magnolia Springs	DRG	1:250,000	Vector	
L_306	TNRIS	USGS	Magnolia Springs	Hypsography	1:24,000	Vector	
L_307	TNRIS	USGS	Pine Forest NE	DOQQ	1:12,000	Raster	1 m
L_308	TNRIS	USGS	Pine Forest NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_309	TNRIS	USGS	Pine Forest NE	DOQQ	1:12,000	Raster	10 m
L_310	TNRIS	USGS	Pine Forest NE	DOQQ	1:12,000	Raster	30 m
L_311	TNRIS	USGS	Pine Forest NW	DOQQ	1:12,000	Raster	1 m
L_312	TNRIS	USGS	Pine Forest NW	DOQQ	1:12,000	Raster	2.5 m
L_313	TNRIS	USGS	Pine Forest NW	DOQQ	1:12,000	Raster	10 m
L_314	TNRIS	USGS	Pine Forest NW	DOQQ	1:12,000	Raster	30 m
L_315	TNRIS	USGS	Pine Forest SE	DOQQ	1:12,000	Raster	1 m
L_316	TNRIS	USGS	Pine Forest SE	DOQQ	1:12,000	Raster	2.5 m
L_317	TNRIS	USGS	Pine Forest SE	DOQQ	1:12,000	Raster	10 m
L_318	TNRIS	USGS	Pine Forest SE	DOQQ	1:12,000	Raster	30 m
L_319	TNRIS	USGS	Pine Forest SW	DOQQ	1:12,000	Raster	1 m
L_320	TNRIS	USGS	Pine Forest SW	DOQQ	1:12,000	Raster	2.5 m
L_321	TNRIS	USGS	Pine Forest SW	DOQQ	1:12,000	Raster	10 m
L_322	TNRIS	USGS	Pine Forest SW	DOQQ	1:12,000	Raster	30 m
L_323	TNRIS	USGS	Pine Forest	DEM	1:24,000	Raster	30 m
L_324	TNRIS	USGS	Pine Forest	DRG	1:24,000	Vector	
L_325	TNRIS	USGS	Pine Forest	DRG	1:100,000	Vector	
L_326	TNRIS	USGS	Pine Forest	DRG	1:250,000	Vector	
L_327	TNRIS	USGS	Pine Forest	Hypsography	1:24,000	Vector	
L_328	TNRIS	USGS	Potato Patch Lake NE	DOQQ	1:12,000	Raster	1 m
L_329	TNRIS	USGS	Potato Patch Lake NE	DOQQ	1:12,000	Raster	2.5 m
L_330	TNRIS	USGS	Potato Patch Lake NE	DOQQ	1:12,000	Raster	10 m
L_331	TNRIS	USGS	Potato Patch Lake NE	DOQQ	1:12,000	Raster	30 m
L_332	TNRIS	USGS	Potato Patch Lake NW	DOQQ	1:12,000	Raster	1 m
L_333	TNRIS	USGS	Potato Patch Lake NW	DOQQ	1:12,000	Raster	2.5 m
L_334	TNRIS	USGS	Potato Patch Lake NW	DOQQ	1:12,000	Raster	10 m
L_335	TNRIS	USGS	Potato Patch Lake NW	DOQQ	1:12,000	Raster	30 m
L_336	TNRIS	USGS	Potato Patch Lake SE	DOQQ	1:12,000	Raster	1 m
L_337	TNRIS	USGS	Potato Patch Lake SE	DOQQ	1:12,000	Raster	2.5 m
L_338	TNRIS	USGS	Potato Patch Lake SE	DOQQ	1:12,000	Raster	10 m
L_339	TNRIS	USGS	Potato Patch Lake SE	DOQQ	1:12,000	Raster	30 m
L_340	TNRIS	USGS	Potato Patch Lake SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_341	TNRIS	USGS	Potato Patch Lake SW	DOQQ	1:12,000	Raster	2.5 m
L_342	TNRIS	USGS	Potato Patch Lake SW	DOQQ	1:12,000	Raster	10 m
L_343	TNRIS	USGS	Potato Patch Lake SW	DOQQ	1:12,000	Raster	30 m
L_344	TNRIS	USGS	Potato Patch Lake	DEM	1:24,000	Raster	30 m
L_345	TNRIS	USGS	Potato Patch Lake	DRG	1:24,000	Vector	
L_346	TNRIS	USGS	Potato Patch Lake	DRG	1:100,000	Vector	
L_347	TNRIS	USGS	Potato Patch Lake	DRG	1:250,000	Vector	
L_348	TNRIS	USGS	Potato Patch Lake	Hypsography	1:24,000	Vector	
L_349	TNRIS	USGS	Saratoga NE	DOQQ	1:12,000	Raster	1 m
L_350	TNRIS	USGS	Saratoga NE	DOQQ	1:12,000	Raster	2.5 m
L_351	TNRIS	USGS	Saratoga NE	DOQQ	1:12,000	Raster	10 m
L_352	TNRIS	USGS	Saratoga NE	DOQQ	1:12,000	Raster	30 m
L_353	TNRIS	USGS	Saratoga NW	DOQQ	1:12,000	Raster	1 m
L_354	TNRIS	USGS	Saratoga NW	DOQQ	1:12,000	Raster	2.5 m
L_355	TNRIS	USGS	Saratoga NW	DOQQ	1:12,000	Raster	10 m
L_356	TNRIS	USGS	Saratoga NW	DOQQ	1:12,000	Raster	30 m
L_357	TNRIS	USGS	Saratoga SE	DOQQ	1:12,000	Raster	1 m
L_358	TNRIS	USGS	Saratoga SE	DOQQ	1:12,000	Raster	2.5 m
L_359	TNRIS	USGS	Saratoga SE	DOQQ	1:12,000	Raster	10 m
L_360	TNRIS	USGS	Saratoga SE	DOQQ	1:12,000	Raster	30 m
L_361	TNRIS	USGS	Saratoga SW	DOQQ	1:12,000	Raster	1 m
L_362	TNRIS	USGS	Saratoga SW	DOQQ	1:12,000	Raster	2.5 m
L_363	TNRIS	USGS	Saratoga SW	DOQQ	1:12,000	Raster	10 m
L_364	TNRIS	USGS	Saratoga SW	DOQQ	1:12,000	Raster	30 m
L_365	TNRIS	USGS	Saratoga	DEM	1:24,000	Raster	30 m
L_366	TNRIS	USGS	Saratoga	DRG	1:24,000	Vector	
L_367	TNRIS	USGS	Saratoga	DRG	1:100,000	Vector	
L_368	TNRIS	USGS	Saratoga	DRG	1:250,000	Vector	
L_369	TNRIS	USGS	Saratoga	Hypsography	1:24,000	Vector	
L_370	TNRIS	USGS	Sour Lake NE	DOQQ	1:12,000	Raster	1 m
L_371	TNRIS	USGS	Sour Lake NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_372	TNRIS	USGS	Sour Lake NE	DOQQ	1:12,000	Raster	10 m
L_373	TNRIS	USGS	Sour Lake NE	DOQQ	1:12,000	Raster	30 m
L_374	TNRIS	USGS	Sour Lake NW	DOQQ	1:12,000	Raster	1 m
L_375	TNRIS	USGS	Sour Lake NW	DOQQ	1:12,000	Raster	2.5 m
L_376	TNRIS	USGS	Sour Lake NW	DOQQ	1:12,000	Raster	10 m
L_377	TNRIS	USGS	Sour Lake NW	DOQQ	1:12,000	Raster	30 m
L_378	TNRIS	USGS	Sour Lake SE	DOQQ	1:12,000	Raster	1 m
L_379	TNRIS	USGS	Sour Lake SE	DOQQ	1:12,000	Raster	2.5 m
L_380	TNRIS	USGS	Sour Lake SE	DOQQ	1:12,000	Raster	10 m
L_381	TNRIS	USGS	Sour Lake SE	DOQQ	1:12,000	Raster	30 m
L_382	TNRIS	USGS	Sour Lake SW	DOQQ	1:12,000	Raster	1 m
L_383	TNRIS	USGS	Sour Lake SW	DOQQ	1:12,000	Raster	2.5 m
L_384	TNRIS	USGS	Sour Lake SW	DOQQ	1:12,000	Raster	10 m
L_385	TNRIS	USGS	Sour Lake SW	DOQQ	1:12,000	Raster	30 m
L_386	TNRIS	USGS	Sour Lake	DEM	1:24,000	Raster	30 m
L_387	TNRIS	USGS	Sour Lake	DRG	1:24,000	Vector	
L_388	TNRIS	USGS	Sour Lake	DRG	1:100,000	Vector	
L_389	TNRIS	USGS	Sour Lake	DRG	1:250,000	Vector	
L_390	TNRIS	USGS	Sour Lake	Hypsography	1:24,000	Vector	
L_391	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	1 m
L_392	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	2.5 m
L_393	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	10 m
L_394	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	30 m
L_395	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	1 m
L_396	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	2.5 m
L_397	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	10 m
L_398	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	30 m
L_399	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	1 m
L_400	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	2.5 m
L_401	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	10 m
L_402	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	30 m
L_403	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_404	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	2.5 m
L_405	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	10 m
L_406	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	30 m
L_407	TNRIS	USGS	Spurger	DEM	1:24,000	Raster	30 m
L_408	TNRIS	USGS	Spurger	DRG	1:24,000	Vector	
L_409	TNRIS	USGS	Spurger	DRG	1:100,000	Vector	
L_410	TNRIS	USGS	Spurger	DRG	1:250,000	Vector	
L_411	TNRIS	USGS	Spurger	Hypsography	1:24,000	Vector	
L_412	TNRIS	USGS	Thorson Gully NE	DOQQ	1:12,000	Raster	1 m
L_413	TNRIS	USGS	Thorson Gully NE	DOQQ	1:12,000	Raster	2.5 m
L_414	TNRIS	USGS	Thorson Gully NE	DOQQ	1:12,000	Raster	10 m
L_415	TNRIS	USGS	Thorson Gully NE	DOQQ	1:12,000	Raster	30 m
L_416	TNRIS	USGS	Thorson Gully NW	DOQQ	1:12,000	Raster	1 m
L_417	TNRIS	USGS	Thorson Gully NW	DOQQ	1:12,000	Raster	2.5 m
L_418	TNRIS	USGS	Thorson Gully NW	DOQQ	1:12,000	Raster	10 m
L_419	TNRIS	USGS	Thorson Gully NW	DOQQ	1:12,000	Raster	30 m
L_420	TNRIS	USGS	Thorson Gully SE	DOQQ	1:12,000	Raster	1 m
L_421	TNRIS	USGS	Thorson Gully SE	DOQQ	1:12,000	Raster	2.5 m
L_422	TNRIS	USGS	Thorson Gully SE	DOQQ	1:12,000	Raster	10 m
L_423	TNRIS	USGS	Thorson Gully SE	DOQQ	1:12,000	Raster	30 m
L_424	TNRIS	USGS	Thorson Gully SW	DOQQ	1:12,000	Raster	1 m
L_425	TNRIS	USGS	Thorson Gully SW	DOQQ	1:12,000	Raster	2.5 m
L_426	TNRIS	USGS	Thorson Gully SW	DOQQ	1:12,000	Raster	10 m
L_427	TNRIS	USGS	Thorson Gully SW	DOQQ	1:12,000	Raster	30 m
L_428	TNRIS	USGS	Thorson Gully	DEM	1:24,000	Raster	30 m
L_429	TNRIS	USGS	Thorson Gully	DRG	1:24,000	Vector	
L_430	TNRIS	USGS	Thorson Gully	DRG	1:100,000	Vector	
L_431	TNRIS	USGS	Thorson Gully	DRG	1:250,000	Vector	
L_432	TNRIS	USGS	Thorson Gully	Hypsography	1:24,000	Vector	
L_433	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	1 m
L_434	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_435	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	10 m
L_436	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	30 m
L_437	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	1 m
L_438	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	2.5 m
L_439	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	10 m
L_440	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	30 m
L_441	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	1 m
L_442	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	2.5 m
L_443	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	10 m
L_444	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	30 m
L_445	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	1 m
L_446	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	2.5 m
L_447	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	10 m
L_448	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	30 m
L_449	TNRIS	USGS	Town Bluff	DEM	1:24,000	Raster	30 m
L_450	TNRIS	USGS	Town Bluff	DRG	1:24,000	Vector	
L_451	TNRIS	USGS	Town Bluff	DRG	1:100,000	Vector	
L_452	TNRIS	USGS	Town Bluff	DRG	1:250,000	Vector	
L_453	TNRIS	USGS	Town Bluff	Hypsography	1:24,000	Vector	
L_454	TNRIS	USGS	Voth NE	DOQQ	1:12,000	Raster	1 m
L_455	TNRIS	USGS	Voth NE	DOQQ	1:12,000	Raster	2.5 m
L_456	TNRIS	USGS	Voth NE	DOQQ	1:12,000	Raster	10 m
L_457	TNRIS	USGS	Voth NE	DOQQ	1:12,000	Raster	30 m
L_458	TNRIS	USGS	Voth NW	DOQQ	1:12,000	Raster	1 m
L_459	TNRIS	USGS	Voth NW	DOQQ	1:12,000	Raster	2.5 m
L_460	TNRIS	USGS	Voth NW	DOQQ	1:12,000	Raster	10 m
L_461	TNRIS	USGS	Voth NW	DOQQ	1:12,000	Raster	30 m
L_462	TNRIS	USGS	Voth SE	DOQQ	1:12,000	Raster	1 m
L_463	TNRIS	USGS	Voth SE	DOQQ	1:12,000	Raster	2.5 m
L_464	TNRIS	USGS	Voth SE	DOQQ	1:12,000	Raster	10 m
L_465	TNRIS	USGS	Voth SE	DOQQ	1:12,000	Raster	30 m
L_466	TNRIS	USGS	Voth SW	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_467	TNRIS	USGS	Voth SW	DOQQ	1:12,000	Raster	2.5 m
L_468	TNRIS	USGS	Voth SW	DOQQ	1:12,000	Raster	10 m
L_469	TNRIS	USGS	Voth SW	DOQQ	1:12,000	Raster	30 m
L_470	TNRIS	USGS	Voth	DEM	1:24,000	Raster	30 m
L_471	TNRIS	USGS	Voth	DRG	1:24,000	Vector	
L_472	TNRIS	USGS	Voth	DRG	1:100,000	Vector	
L_473	TNRIS	USGS	Voth	DRG	1:250,000	Vector	
L_474	TNRIS	USGS	Voth	Hypsography	1:24,000	Vector	
L_475	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_476	TNRIS		Jasper County	DOQ Mosaic	1:12,000	Raster	1 m
L_477	TNRIS		Jefferson County	DOQ Mosaic	1:12,000	Raster	1 m
L_478	TNRIS		Liberty County	DOQ Mosaic	1:12,000	Raster	1 m
L_479	TNRIS		Orange County	DOQ Mosaic	1:12,000	Raster	1 m
L_480	TNRIS		Tyler County	DOQ Mosaic	1:12,000	Raster	1 m
L_481	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_482	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_483	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_484	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_485	USGS	USGS	Lower Neches Watershed	NHD	1:100,000	Vector	
L_486	USGS	USGS	Pine Island Bayou Watershed	NHD	1:100,000	Vector	
L_487	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_488	RRC	RRC	Hardin County	Pipeline and Well			
L_489	RRC	RRC	Jasper County	Pipeline and Well			
L_490	RRC	RRC	Jefferson County	Pipeline and Well			
L_491	RRC	RRC	Orange County	Pipeline and Well			
L_492	RRC	RRC	Tyler County	Pipeline and Well			
L_493	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_494	TNRIS/NRCS	NRCS	Jasper County	Soil	1:24,000	Vector	1 m
L_495	TNRIS/NRCS	NRCS	Jefferson County	Soil	1:24,000	Vector	1 m
L_496	TNRIS/NRCS	NRCS	Liberty County	Soil	1:24,000	Vector	1 m
L_497	TNRIS/NRCS	NRCS	Orange County	Soil	1:24,000	Vector	1 m
L_498	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_499	TNRIS	TxDOT	Jasper County	Transportation Urban		Vector	
L_500	TNRIS	TxDOT	Jefferson County	Transportation Urban		Vector	
L_501	TNRIS	TxDOT	Liberty County	Transportation Urban		Vector	
L_502	TNRIS	TxDOT	Orange County	Transportation Urban		Vector	
L_503	TNRIS	TxDOT	Tyler County	Transportation Urban		Vector	
Beech Creek Unit							
L_504	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	1 m
L_505	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	2.5 m
L_506	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	10 m
L_507	TNRIS	USGS	Spurger NE	DOQQ	1:12,000	Raster	30 m
L_508	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	1 m
L_509	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	2.5 m
L_510	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	10 m
L_511	TNRIS	USGS	Spurger NW	DOQQ	1:12,000	Raster	30 m
L_512	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	1 m
L_513	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	2.5 m
L_514	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	10 m
L_515	TNRIS	USGS	Spurger SE	DOQQ	1:12,000	Raster	30 m
L_516	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	1 m
L_517	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	2.5 m
L_518	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	10 m
L_519	TNRIS	USGS	Spurger SW	DOQQ	1:12,000	Raster	30 m
L_520	TNRIS	USGS	Spurger	DEM	1:24,000	Raster	30 m
L_521	TNRIS	USGS	Spurger	DRG	1:24,000	Vector	
L_522	TNRIS	USGS	Spurger	DRG	1:100,000	Vector	
L_523	TNRIS	USGS	Spurger	DRG	1:250,000	Vector	
L_524	TNRIS	USGS	Spurger	Hypsography	1:24,000	Vector	
L_525	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	1 m
L_526	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	2.5 m
L_527	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	10 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_528	TNRIS	USGS	Town Bluff NE	DOQQ	1:12,000	Raster	30 m
L_529	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	1 m
L_530	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	2.5 m
L_531	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	10 m
L_532	TNRIS	USGS	Town Bluff NW	DOQQ	1:12,000	Raster	30 m
L_533	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	1 m
L_534	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	2.5 m
L_535	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	10 m
L_536	TNRIS	USGS	Town Bluff SE	DOQQ	1:12,000	Raster	30 m
L_537	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	1 m
L_538	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	2.5 m
L_539	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	10 m
L_540	TNRIS	USGS	Town Bluff SW	DOQQ	1:12,000	Raster	30 m
L_541	TNRIS	USGS	Town Bluff	DEM	1:24,000	Raster	30 m
L_542	TNRIS	USGS	Town Bluff	DRG	1:24,000	Vector	
L_543	TNRIS	USGS	Town Bluff	DRG	1:100,000	Vector	
L_544	TNRIS	USGS	Town Bluff	DRG	1:250,000	Vector	
L_545	TNRIS	USGS	Town Bluff	Hypsography	1:24,000	Vector	
L_546	TNRIS		Jasper County	DOQ Mosaic	1:12,000	Raster	1 m
L_547	TNRIS		Tyler County	DOQ Mosaic	1:12,000	Raster	1 m
L_548	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_549	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_550	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_551	RRC	RRC	Tyler County	Pipeline and Well			
L_552	TNRIS/NRCS	NRCS	Jasper County	Soil	1:24,000	Vector	1 m
L_553	TNRIS	TxDOT	Jasper County	Transportation Urban		Vector	
L_554	TNRIS	TxDOT	Tyler County	Transportation Urban		Vector	
Turkey Creek Unit							
L_555	TNRIS	USGS	Hicksbaugh NE	DOQQ	1:12,000	Raster	1 m
L_556	TNRIS	USGS	Hicksbaugh NE	DOQQ	1:12,000	Raster	2.5 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_557	TNRIS	USGS	Hicksbaugh NE	DOQQ	1:12,000	Raster	10 m
L_558	TNRIS	USGS	Hicksbaugh NE	DOQQ	1:12,000	Raster	30 m
L_559	TNRIS	USGS	Hicksbaugh NW	DOQQ	1:12,000	Raster	1 m
L_560	TNRIS	USGS	Hicksbaugh NW	DOQQ	1:12,000	Raster	2.5 m
L_561	TNRIS	USGS	Hicksbaugh NW	DOQQ	1:12,000	Raster	10 m
L_562	TNRIS	USGS	Hicksbaugh NW	DOQQ	1:12,000	Raster	30 m
L_563	TNRIS	USGS	Hicksbaugh SE	DOQQ	1:12,000	Raster	1 m
L_564	TNRIS	USGS	Hicksbaugh SE	DOQQ	1:12,000	Raster	2.5 m
L_565	TNRIS	USGS	Hicksbaugh SE	DOQQ	1:12,000	Raster	10 m
L_566	TNRIS	USGS	Hicksbaugh SE	DOQQ	1:12,000	Raster	30 m
L_567	TNRIS	USGS	Hicksbaugh SW	DOQQ	1:12,000	Raster	1 m
L_568	TNRIS	USGS	Hicksbaugh SW	DOQQ	1:12,000	Raster	2.5 m
L_569	TNRIS	USGS	Hicksbaugh SW	DOQQ	1:12,000	Raster	10 m
L_570	TNRIS	USGS	Hicksbaugh SW	DOQQ	1:12,000	Raster	30 m
L_571	TNRIS	USGS	Hicksbaugh	DEM	1:24,000	Raster	30 m
L_572	TNRIS	USGS	Hicksbaugh	DRG	1:24,000	Vector	
L_573	TNRIS	USGS	Hicksbaugh	DRG	1:100,000	Vector	
L_574	TNRIS	USGS	Hicksbaugh	DRG	1:250,000	Vector	
L_575	TNRIS	USGS	Hicksbaugh	Hypsography	1:24,000	Vector	
L_576	TNRIS	USGS	Kountze North NE	DOQQ	1:12,000	Raster	1 m
L_577	TNRIS	USGS	Kountze North NE	DOQQ	1:12,000	Raster	2.5 m
L_578	TNRIS	USGS	Kountze North NE	DOQQ	1:12,000	Raster	10 m
L_579	TNRIS	USGS	Kountze North NE	DOQQ	1:12,000	Raster	30 m
L_580	TNRIS	USGS	Kountze North NW	DOQQ	1:12,000	Raster	1 m
L_581	TNRIS	USGS	Kountze North NW	DOQQ	1:12,000	Raster	2.5 m
L_582	TNRIS	USGS	Kountze North NW	DOQQ	1:12,000	Raster	10 m
L_583	TNRIS	USGS	Kountze North NW	DOQQ	1:12,000	Raster	30 m
L_584	TNRIS	USGS	Kountze North SE	DOQQ	1:12,000	Raster	1 m
L_585	TNRIS	USGS	Kountze North SE	DOQQ	1:12,000	Raster	2.5 m
L_586	TNRIS	USGS	Kountze North SE	DOQQ	1:12,000	Raster	10 m
L_587	TNRIS	USGS	Kountze North SE	DOQQ	1:12,000	Raster	30 m
L_588	TNRIS	USGS	Kountze North SW	DOQQ	1:12,000	Raster	1 m

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
L_589	TNRIS	USGS	Kountze North SW	DOQQ	1:12,000	Raster	2.5 m
L_590	TNRIS	USGS	Kountze North SW	DOQQ	1:12,000	Raster	10 m
L_591	TNRIS	USGS	Kountze North SW	DOQQ	1:12,000	Raster	30 m
L_592	TNRIS	USGS	Kountze North	DEM	1:24,000	Raster	30 m
L_593	TNRIS	USGS	Kountze North	DRG	1:24,000	Vector	
L_594	TNRIS	USGS	Kountze North	DRG	1:100,000	Vector	
L_595	TNRIS	USGS	Kountze North	DRG	1:250,000	Vector	
L_596	TNRIS	USGS	Kountze North	Hypsography	1:24,000	Vector	
L_597	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_598	TNRIS		Tyler County	DOQ Mosaic	1:12,000	Raster	1 m
L_599	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_600	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_601	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_602	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_603	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_604	RRC	RRC	Hardin County	Pipeline and Well			
L_605	RRC	RRC	Tyler County	Pipeline and Well			
L_606	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_607	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
L_608	TNRIS	TxDOT	Tyler County	Transportation Urban		Vector	
Un-named just west of Turkey Creek Unit							
L_609	TNRIS	USGS	Village Mills NW	DOQQ	1:12,000	Raster	1 m
L_610	TNRIS	USGS	Village Mills NE	DOQQ	1:12,000	Raster	1 m
L_611	TNRIS	USGS	Village Mills SW	DOQQ	1:12,000	Raster	1 m
L_612	TNRIS	USGS	Village Mills SE	DOQQ	1:12,000	Raster	1 m
L_613	TNRIS	USGS	Village Mills NW	DOQQ	1:12,000	Raster	2.5 m
L_614	TNRIS	USGS	Village Mills NE	DOQQ	1:12,000	Raster	2.5 m
L_615	TNRIS	USGS	Village Mills SW	DOQQ	1:12,000	Raster	2.5 m
L_616	TNRIS	USGS	Village Mills SE	DOQQ	1:12,000	Raster	2.5 m
L_617	TNRIS	USGS	Village Mills NW	DOQQ	1:12,000	Raster	10 m

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
L_618	TNRIS	USGS	Village Mills NE	DOQQ	1:12,000	Raster	10 m
L_619	TNRIS	USGS	Village Mills SW	DOQQ	1:12,000	Raster	10 m
L_620	TNRIS	USGS	Village Mills SE	DOQQ	1:12,000	Raster	10 m
L_621	TNRIS	USGS	Village Mills NW	DOQQ	1:12,000	Raster	30 m
L_622	TNRIS	USGS	Village Mills NE	DOQQ	1:12,000	Raster	30 m
L_623	TNRIS	USGS	Village Mills SW	DOQQ	1:12,000	Raster	30 m
L_624	TNRIS	USGS	Village Mills SE	DOQQ	1:12,000	Raster	30 m
L_625	TNRIS	USGS	Village Mills	DEM	1:24,000	Raster	30 m
L_626	TNRIS	USGS	Village Mills	DRG	1:24,000	Vector	
L_627	TNRIS	USGS	Village Mills	DRG	1:100,000	Vector	
L_628	TNRIS	USGS	Village Mills	DRG	1:250,000	Vector	
L_629	TNRIS	USGS	Village Mills	Hypsography	1:24,000	Vector	
L_630	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_631	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_632	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_633	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_634	RRC	RRC	Hardin County	Pipeline and Well			
L_635	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_636	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
Hickory Creek Savannah Unit							
L_637	TNRIS	USGS	Warren NW	DOQQ	1:12,000	Raster	1 m
L_638	TNRIS	USGS	Warren NE	DOQQ	1:12,000	Raster	1 m
L_639	TNRIS	USGS	Warren SW	DOQQ	1:12,000	Raster	1 m
L_640	TNRIS	USGS	Warren SE	DOQQ	1:12,000	Raster	1 m
L_641	TNRIS	USGS	Warren NW	DOQQ	1:12,000	Raster	2.5 m
L_642	TNRIS	USGS	Warren NE	DOQQ	1:12,000	Raster	2.5 m
L_643	TNRIS	USGS	Warren SW	DOQQ	1:12,000	Raster	2.5 m
L_644	TNRIS	USGS	Warren SE	DOQQ	1:12,000	Raster	2.5 m
L_645	TNRIS	USGS	Warren NW	DOQQ	1:12,000	Raster	10 m
L_646	TNRIS	USGS	Warren NE	DOQQ	1:12,000	Raster	10 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed							
ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_647	TNRIS	USGS	Warren SW	DOQQ	1:12,000	Raster	10 m
L_648	TNRIS	USGS	Warren SE	DOQQ	1:12,000	Raster	10 m
L_649	TNRIS	USGS	Warren NW	DOQQ	1:12,000	Raster	30 m
L_650	TNRIS	USGS	Warren NE	DOQQ	1:12,000	Raster	30 m
L_651	TNRIS	USGS	Warren SW	DOQQ	1:12,000	Raster	30 m
L_652	TNRIS	USGS	Warren SE	DOQQ	1:12,000	Raster	30 m
L_653	TNRIS	USGS	Warren	DEM	1:24,000	Raster	30 m
L_654	TNRIS	USGS	Warren	DRG	1:24,000	Vector	
L_655	TNRIS	USGS	Warren	DRG	1:100,000	Vector	
L_656	TNRIS	USGS	Warren	DRG	1:250,000	Vector	
L_657	TNRIS	USGS	Warren	Hypsography	1:24,000	Vector	
L_658	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_659	TNRIS		Tyler County	DOQ Mosaic	1:12,000	Raster	1 m
L_660	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_661	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_662	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_663	RRC	RRC	Tyler County	Pipeline and Well			
L_664	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_665	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
L_666	TNRIS	TxDOT	Tyler County	Transportation Urban		Vector	
Surrounding Quads							
L_667	TNRIS	USGS	Beech Grove NE	DOQQ	1:12,000	Raster	1 m
L_668	TNRIS	USGS	Beech Grove NE	DOQQ	1:12,000	Raster	2.5 m
L_669	TNRIS	USGS	Beech Grove NE	DOQQ	1:12,000	Raster	10 m
L_670	TNRIS	USGS	Beech Grove NE	DOQQ	1:12,000	Raster	30 m
L_671	TNRIS	USGS	Beech Grove NW	DOQQ	1:12,000	Raster	1 m
L_672	TNRIS	USGS	Beech Grove NW	DOQQ	1:12,000	Raster	2.5 m
L_673	TNRIS	USGS	Beech Grove NW	DOQQ	1:12,000	Raster	10 m
L_674	TNRIS	USGS	Beech Grove NW	DOQQ	1:12,000	Raster	30 m
L_675	TNRIS	USGS	Beech Grove SE	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_676	TNRIS	USGS	Beech Grove SE	DOQQ	1:12,000	Raster	2.5 m
L_677	TNRIS	USGS	Beech Grove SE	DOQQ	1:12,000	Raster	10 m
L_678	TNRIS	USGS	Beech Grove SE	DOQQ	1:12,000	Raster	30 m
L_679	TNRIS	USGS	Beech Grove SW	DOQQ	1:12,000	Raster	1 m
L_680	TNRIS	USGS	Beech Grove SW	DOQQ	1:12,000	Raster	2.5 m
L_681	TNRIS	USGS	Beech Grove SW	DOQQ	1:12,000	Raster	10 m
L_682	TNRIS	USGS	Beech Grove SW	DOQQ	1:12,000	Raster	30 m
L_683	TNRIS	USGS	Beech Grove	DEM	1:24,000	Raster	30 m
L_684	TNRIS	USGS	Beech Grove	DRG	1:24,000	Vector	
L_685	TNRIS	USGS	Beech Grove	DRG	1:100,000	Vector	
L_686	TNRIS	USGS	Beech Grove	DRG	1:250,000	Vector	
L_687	TNRIS	USGS	Beech Grove	Hypsography	1:24,000	Vector	
L_688	TNRIS	USGS	Bragg NE	DOQQ	1:12,000	Raster	1 m
L_689	TNRIS	USGS	Bragg NE	DOQQ	1:12,000	Raster	2.5 m
L_690	TNRIS	USGS	Bragg NE	DOQQ	1:12,000	Raster	10 m
L_691	TNRIS	USGS	Bragg NE	DOQQ	1:12,000	Raster	30 m
L_692	TNRIS	USGS	Bragg NW	DOQQ	1:12,000	Raster	1 m
L_693	TNRIS	USGS	Bragg NW	DOQQ	1:12,000	Raster	2.5 m
L_694	TNRIS	USGS	Bragg NW	DOQQ	1:12,000	Raster	10 m
L_695	TNRIS	USGS	Bragg NW	DOQQ	1:12,000	Raster	30 m
L_696	TNRIS	USGS	Bragg SE	DOQQ	1:12,000	Raster	1 m
L_697	TNRIS	USGS	Bragg SE	DOQQ	1:12,000	Raster	2.5 m
L_698	TNRIS	USGS	Bragg SE	DOQQ	1:12,000	Raster	10 m
L_699	TNRIS	USGS	Bragg SE	DOQQ	1:12,000	Raster	30 m
L_700	TNRIS	USGS	Bragg SW	DOQQ	1:12,000	Raster	1 m
L_701	TNRIS	USGS	Bragg SW	DOQQ	1:12,000	Raster	2.5 m
L_702	TNRIS	USGS	Bragg SW	DOQQ	1:12,000	Raster	10 m
L_703	TNRIS	USGS	Bragg SW	DOQQ	1:12,000	Raster	30 m
L_704	TNRIS	USGS	Bragg	DEM	1:24,000	Raster	30 m
L_705	TNRIS	USGS	Bragg	DRG	1:24,000	Vector	
L_706	TNRIS	USGS	Bragg	DRG	1:100,000	Vector	
L_707	TNRIS	USGS	Bragg	DRG	1:250,000	Vector	

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_708	TNRIS	USGS	Bragg	Hypsography	1:24,000	Vector	
L_709	TNRIS	USGS	Jacks Creek South NE	DOQQ	1:12,000	Raster	1 m
L_710	TNRIS	USGS	Jacks Creek South NE	DOQQ	1:12,000	Raster	2.5 m
L_711	TNRIS	USGS	Jacks Creek South NE	DOQQ	1:12,000	Raster	10 m
L_712	TNRIS	USGS	Jacks Creek South NE	DOQQ	1:12,000	Raster	30 m
L_713	TNRIS	USGS	Jacks Creek South NW	DOQQ	1:12,000	Raster	1 m
L_714	TNRIS	USGS	Jacks Creek South NW	DOQQ	1:12,000	Raster	2.5 m
L_715	TNRIS	USGS	Jacks Creek South NW	DOQQ	1:12,000	Raster	10 m
L_716	TNRIS	USGS	Jacks Creek South NW	DOQQ	1:12,000	Raster	30 m
L_717	TNRIS	USGS	Jacks Creek South SE	DOQQ	1:12,000	Raster	1 m
L_718	TNRIS	USGS	Jacks Creek South SE	DOQQ	1:12,000	Raster	2.5 m
L_719	TNRIS	USGS	Jacks Creek South SE	DOQQ	1:12,000	Raster	10 m
L_720	TNRIS	USGS	Jacks Creek South SE	DOQQ	1:12,000	Raster	30 m
L_721	TNRIS	USGS	Jacks Creek South SW	DOQQ	1:12,000	Raster	1 m
L_722	TNRIS	USGS	Jacks Creek South SW	DOQQ	1:12,000	Raster	2.5 m
L_723	TNRIS	USGS	Jacks Creek South SW	DOQQ	1:12,000	Raster	10 m
L_724	TNRIS	USGS	Jacks Creek South SW	DOQQ	1:12,000	Raster	30 m
L_725	TNRIS	USGS	Jacks Creek South	DEM	1:24,000	Raster	30 m
L_726	TNRIS	USGS	Jacks Creek South	DRG	1:24,000	Vector	
L_727	TNRIS	USGS	Jacks Creek South	DRG	1:100,000	Vector	
L_728	TNRIS	USGS	Jacks Creek South	DRG	1:250,000	Vector	
L_729	TNRIS	USGS	Jacks Creek South	Hypsography	1:24,000	Vector	
L_730	TNRIS	USGS	Schwab City NE	DOQQ	1:12,000	Raster	1 m
L_731	TNRIS	USGS	Schwab City NE	DOQQ	1:12,000	Raster	2.5 m
L_732	TNRIS	USGS	Schwab City NE	DOQQ	1:12,000	Raster	10 m
L_733	TNRIS	USGS	Schwab City NE	DOQQ	1:12,000	Raster	30 m
L_734	TNRIS	USGS	Schwab City NW	DOQQ	1:12,000	Raster	1 m
L_735	TNRIS	USGS	Schwab City NW	DOQQ	1:12,000	Raster	2.5 m
L_736	TNRIS	USGS	Schwab City NW	DOQQ	1:12,000	Raster	10 m
L_737	TNRIS	USGS	Schwab City NW	DOQQ	1:12,000	Raster	30 m
L_738	TNRIS	USGS	Schwab City SE	DOQQ	1:12,000	Raster	1 m

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_739	TNRIS	USGS	Schwab City SE	DOQQ	1:12,000	Raster	2.5 m
L_740	TNRIS	USGS	Schwab City SE	DOQQ	1:12,000	Raster	10 m
L_741	TNRIS	USGS	Schwab City SE	DOQQ	1:12,000	Raster	30 m
L_742	TNRIS	USGS	Schwab City SW	DOQQ	1:12,000	Raster	1 m
L_743	TNRIS	USGS	Schwab City SW	DOQQ	1:12,000	Raster	2.5 m
L_744	TNRIS	USGS	Schwab City SW	DOQQ	1:12,000	Raster	10 m
L_745	TNRIS	USGS	Schwab City SW	DOQQ	1:12,000	Raster	30 m
L_746	TNRIS	USGS	Schwab City	DEM	1:24,000	Raster	30 m
L_747	TNRIS	USGS	Schwab City	DRG	1:24,000	Vector	
L_748	TNRIS	USGS	Schwab City	DRG	1:100,000	Vector	
L_749	TNRIS	USGS	Schwab City	DRG	1:250,000	Vector	
L_750	TNRIS	USGS	Schwab City	Hypsography	1:24,000	Vector	
L_751	TNRIS	USGS	Silsbee NE	DOQQ	1:12,000	Raster	1 m
L_752	TNRIS	USGS	Silsbee NE	DOQQ	1:12,000	Raster	2.5 m
L_753	TNRIS	USGS	Silsbee NE	DOQQ	1:12,000	Raster	10 m
L_754	TNRIS	USGS	Silsbee NE	DOQQ	1:12,000	Raster	30 m
L_755	TNRIS	USGS	Silsbee NW	DOQQ	1:12,000	Raster	1 m
L_756	TNRIS	USGS	Silsbee NW	DOQQ	1:12,000	Raster	2.5 m
L_757	TNRIS	USGS	Silsbee NW	DOQQ	1:12,000	Raster	10 m
L_758	TNRIS	USGS	Silsbee NW	DOQQ	1:12,000	Raster	30 m
L_759	TNRIS	USGS	Silsbee SE	DOQQ	1:12,000	Raster	1 m
L_760	TNRIS	USGS	Silsbee SE	DOQQ	1:12,000	Raster	2.5 m
L_761	TNRIS	USGS	Silsbee SE	DOQQ	1:12,000	Raster	10 m
L_762	TNRIS	USGS	Silsbee SE	DOQQ	1:12,000	Raster	30 m
L_763	TNRIS	USGS	Silsbee SW	DOQQ	1:12,000	Raster	1 m
L_764	TNRIS	USGS	Silsbee SW	DOQQ	1:12,000	Raster	2.5 m
L_765	TNRIS	USGS	Silsbee SW	DOQQ	1:12,000	Raster	10 m
L_766	TNRIS	USGS	Silsbee SW	DOQQ	1:12,000	Raster	30 m
L_767	TNRIS	USGS	Silsbee	DEM	1:24,000	Raster	30 m
L_768	TNRIS	USGS	Silsbee	DRG	1:24,000	Vector	
L_769	TNRIS	USGS	Silsbee	DRG	1:100,000	Vector	
L_770	TNRIS	USGS	Silsbee	DRG	1:250,000	Vector	

Park Specific (Local): by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
L_771	TNRIS	USGS	Silsbee	Hypsography	1:24,000	Vector	
L_772	TNRIS		Hardin County	DOQ Mosaic	1:12,000	Raster	1 m
L_773	TNRIS		Jasper County	DOQ Mosaic	1:12,000	Raster	1 m
L_774	TNRIS		Polk County	DOQ Mosaic	1:12,000	Raster	1 m
L_775	TNRIS		San Jacinto County	DOQ Mosaic	1:12,000	Raster	1 m
L_776	TNRIS		Tyler County	DOQ Mosaic	1:12,000	Raster	1 m
L_777	TNRIS	TWDB	Beaumont Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_778	TNRIS	TWDB	Livingston Degree Block (31N 30S 95W 94E)	Hillshade		Vector	
L_779	TNRIS		Beaumont Degree Block (31N 30S 95W 94E)	NED			
L_780	TNRIS		Livingston Degree Block (31N 30S 95W 94E)	NED			
L_781	USGS	USGS	Lower Neches Watershed	NHD	1:100,000	Vector	
L_782	USGS	USGS	Lower Trinity-Kickapoo Watershed	NHD	1:100,000	Vector	
L_783	USGS	USGS	Pine Island Bayou Watershed	NHD	1:100,000	Vector	
L_784	USGS	USGS	Village Watershed	NHD	1:100,000	Vector	
L_785	RRC	RRC	Hardin County	Pipeline and Well			
L_786	RRC	RRC	Jasper County	Pipeline and Well			
L_787	RRC	RRC	Polk County	Pipeline and Well			
L_788	RRC	RRC	Tyler County	Pipeline and Well			
L_789	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_790	TNRIS/NRCS	NRCS	Hardin County	Soil	1:24,000	Vector	1 m
L_791	TNRIS/NRCS	NRCS	Jasper County	Soil	1:24,000	Vector	1 m
L_792	TNRIS/NRCS	NRCS	Polk County	Soil	1:24,000	Vector	1 m
L_793	TNRIS/NRCS	NRCS	San Jacinto County	Soil	1:24,000	Vector	1 m
L_794	TNRIS	TxDOT	Hardin County	Transportation Urban		Vector	
L_795	TNRIS	TxDOT	Jasper County	Transportation Urban		Vector	
L_796	TNRIS	TxDOT	Polk County	Transportation Urban		Vector	
L_797	TNRIS	TxDOT	San Jacinto County	Transportation Urban		Vector	
L_798	TNRIS	TxDOT	Tyler County	Transportation Urban		Vector	

Texas Coast

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
C_1	TGLO	TCCC	Coastal Management Program Boundary	Archeological Sites	1:24,000	Vector
C_2	TGLO	CCC	Coastal Management Program Boundary	Coastal Management Zone Boundary	1:24,000	Vector
C_3	TGLO	CCC	Coastal Management Program Boundary	National Register of Historic Places	1:24,000	Vector
C_4	TGLO	LOSCO	Gulf Coast	Offshore Oil/Gas Platforms		Vector
C_5	TGLO		Gulf Coast	Three Nautical Mile Line		Vector
C_6	TGLO	TGLO/TPWD	Gulf Coast (Upper)	Priority Protection Habitat Areas (Upper Coast)	1:24,000	Vector
C_7	TGLO	USMMS	Gulf Coast (Western)	Offshore Lease Blocks		Vector
C_8	TGLO	USACE/TGLO	Gulf Coast (Western)	Shipping Safety Fairways		Vector
C_9	TGLO (NRI)	GERG	State Coast	Aliphatics (Current)		Vector
C_10	TGLO (NRI)	GERG	State Coast	Aliphatics (Historical)		Vector
C_11	TGLO (NRI)	GERG	State Coast	Aromatics (Current)		Vector
C_12	TGLO (NRI)	TPWD	State Coast	Bag Seine Sample Locations		Vector
C_13	TGLO (NRI)	TPWD	State Coast	Beach Seine Sample Locations		Vector
C_14	TGLO (NRI)	TPWD	State Coast	Boat Ramps	1:40,000	Vector
C_15	TGLO	USFW/TGLO	State Coast	Coastal Barrier Resource System	1:24,000	Vector
C_16	TGLO	TGLO	State Coast	Critical Erosion Areas	1:24,000	Vector
C_17	TGLO	TGLO	State Coast	Dredged Material Placement Sites		Vector
C_18	TGLO	TGLO	State Coast	Dune Protection Lines	1:24,000	Vector
C_19	TGLO (NRI)	TPWD	State Coast	Gill Net Sample Locations		Vector
C_20	TGLO (NRI)	GERG	State Coast	Grain Sizes (Current)		Vector
C_21	TGLO (NRI)	TGLO	State Coast	Gulf Beach Access Points		Vector
C_22	TGLO	LOSCO	State Coast	In-Situ Burn Exclusion Areas		Vector
C_23	TGLO	TGLO	State Coast	Marinas	1:24,000	Vector
C_24	TGLO	TGLO	State Coast	National Marine Sanctuary	1:24,000	Vector
C_25	TGLO	TGLO	State Coast	Oil and Gas Lease Sale Nominations		Vector
C_26	TGLO	TGLO	State Coast	Oil and Gas Leases		Vector
C_27	TGLO	TGLO	State Coast	Oil and Gas Pooling Agreements/Units		Vector
C_28	TGLO (NRI)	GERG	State Coast	Pesticides (Historical)		Vector
C_29	TGLO (NRI)	TPWD	State Coast	Recreational Fishing Survey Sample Locations (Ramp)	1:24,000 (exceptions: Matagorda=1:80,000 Sabine=1:12,000)	Vector

Texas Coast

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
C_30	TGLO (NRI)	TPWD	State Coast	Recreational Fishing Survey Sample Locations (Roving Boat)	1:24,000 (exceptions: Matagorda=1:80,000 Sabine=1:12,000)	Vector
C_31	TGLO (NRI)	BEG	State Coast	Sediment Sampling		Vector
C_32	TGLO	TGLO/TPWD	State Coast	Species/Habitats	1:24,000	Vector
C_33	TGLO	TGLO	State Coast	State Coastal Preserves	1:24,000	Vector
C_34	TGLO	TGLO	State Coast	State Tracts with Resource Management Codes		Vector
C_35	TGLO (NRI)	TPWD	State Coast	Trawl Sample Locations		Vector
C_36	TGLO	BEG	State Coast	Washover Areas	1:24,000	Vector
C_37	TGLO (NRI)	BEG	State Coast	Washover Areas	1:24,000	Vector
C_38	TGLO	CCC	State Coast	Waters of the Open Gulf of Mexico	1:24,000	Vector
C_39	TGLO	CCC	State Coast	Waters Under Tidal Influence		Vector
C_40	TGLO (NRI)	GERG	State Coast (except Sabine Lake)	Aromatics (Historical)		Vector
C_41	TGLO (NRI)	GERG	State Coast (except Sabine Lake)	Pesticides (Current)		Vector
C_42	TGLO (NRI)	GERG	State Coast (except Sabine Lake)	Trace Metals (Historical)		Vector
C_43	TGLO (NRI)	TGLO	State Coast (incomplete)	Marinas		Vector
C_44	TGLO	TPWD	State Coast (Sabine Lake Area)	Land Use/Land Cover (Sabine Lake Area)		Raster
C_45	BEG	BEG	State Coast_ Sabine Pass to Brazos River	Projected Shoreline Data		Vector
C_46	BEG	BEG	State Coast_ Sabine Pass to Brazos River	Projected Shoreline Data		Vector
C_47	BEG	BEG	State Coast_ Sabine Pass to Brazos River	Projected Shoreline Data		Vector
C_48	BEG	BEG	State Coast_ Sabine Pass to Brazos River	Shoreline Change Rates		Vector
C_49	BEG	BEG	State Coast_Sabine Pass to Matagorda Peninsula	Shoreline Types		Vector
C_50	BEG	BEG	State Coast_Upper	Historical Shoreline Data		vector
C_51	TGLO (NRI)	RRC	State Coastal Counties	Horizontal/Directional Wells	1:24,000	Vector
C_52	TGLO	USFW/TGLO	State Coastal Counties	National Wetlands Inventory Data	1:24,000	Vector
C_53	TGLO (NRI)	TGLO	State Coastal Counties	State Parks and Wildlife Management Areas		Vector
C_54	TGLO (NRI)	RRC	State Coastal Counties	Surface Locations	1:24,000	Vector
C_55	TGLO	TGLO	State Coastal Counties	US Coast Guard Stations	1:24,000	Vector
C_56	TGLO (NRI)	RRC	State Coastal Counties	Vertical Wells	1:24,000	Vector
C_57	TGLO	TGLO/TxDOT	State Coastal Counties (Upper)	Roads/Highways (Upper Coast)	1:24,000	Vector

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
S_1	BEG	BEG	State	Oil and Gas Reservoirs		Vector	
S_2	FEMA	FEMA	State	Q3 Flood Data			
S_3	NRCS		State	Precipitation			
S_4	TCEQ		State	Designated Stream Segments		Vector	
S_5	TCEQ		State	Stream Segment Boundaries		Vector	
S_6	TGLO	USACE/TGLO	State	Anchorage Areas		Vector	
S_7	TGLO	TGLO	State	Aquaculture Facilities	1:24,000	Vector	
S_8	TGLO	TGLO	State	Audubon Sanctuaries		Vector	
S_9	TGLO	NOAA/TGLA	State	Bathymetry		Vector	
S_10	TGLO	NOAA/TGLA	State	Bathymetry (6-food depth)		Vector	
S_11	TGLO	TGLO	State	Beach Access	1:24,0000	Vector	
S_12	TGLO	TPWD	State	Boat Ramps	1:24,0000	Vector	
S_13	TGLO	TGLO	State	Cabins	1:24,000	Vector	
S_14	TGLO	TxDOT	State	City and County Parks	1:24,000	Vector	
S_15	TGLO	TxDOT	State	City Limits		Vector	
S_16	TGLO	TGLO	State	Coastal Leases	1:24,000	Vector	
S_17	TGLO	TGLO/TPWD	State	Colonial Waterbird Rookery Areas	1:24,000	Vector	
S_18	TGLO	TNRCC	State	County Boundaries	1:24,000	Vector	
S_19	TGLO		State	Dispersant Use Pre-Approval Zone		Vector	
S_20	TGLO	USGS, TGLO	State	Elevation	1:250,000	Vector	
S_21	TGLO	TGLO/BEG	State	Environmental Sensitivity Index Shoreline		Vector	
S_22	TGLO	USACE/TGLO	State	Gulf Intracoastal Waterway/Ship Channels	1:24,000	Vector	
S_23	TGLO	TxDOT/TGLO	State	Heliports	1:24,000	Vector	
S_24	TGLO		State	Hydrography (coastal)	1:24,000	Vector	
S_25	TGLO	TxDOT/TGLO	State	Hydrography (detailed)	1:24,000	Vector	
S_26	TGLO	TxDOT	State	Hydrography (general)	1:24,000	Vector	
S_27	TGLO	USGS	State	Hydrography (general)	1:2,000,000	Vector	
S_28	TGLO	TGLO	State	National Wildlife Refuges	1:24,000	Vector	
S_29	TGLO	TPWD	State	Natural Regions (major)		Vector	
S_30	TGLO	TPWD	State	Natural Regions (sub)		Vector	
S_31	TGLO		State	Oil and Gas Pipelines		Vector	
S_32	TGLO	TGLO	State	Place Names	1:750,000	Vector	
S_33	TGLO	USGS/TGLO	State	Place Names	1:24,000	Vector	

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
S_34	TGLO	TGLO	State	Place Names (populated)		Vector	
S_35	TGLO	TxDOT	State	Railroads	1:24,000	Vector	
S_36	TGLO	TWDB	State	Rainfall			
S_37	TGLO	USDOT	State	Roads/Highways	1:24,000	Vector	
S_38	TGLO	NOAA/NOS/NGS	State	Shoreline	variable (source scale is listed in attribute table of features)	Vector	
S_39	TGLO	TPWD	State	State Parks/Wildlife Management Areas	1:24;000	Vector	
S_40	TGLO	TGLO	State	Submerged Lands		Vector	
S_41	TGLO	USGS/TGLO	State	Topography	1:250,000	Raster	5000 ft
S_42	TGLO	TGLO	State	Urban Areas	1:24,000	Vector	
S_43	TGLO	TPWD	State	Vegetation Areas		Vector	
S_44	TGLO (NRI)	TNRCC	State	Air Monitoring Stations	1:24,000/1:100,000	Vector	
S_45	TGLO (NRI)	RRC	State	Tidal Disposal Facilities		Vector	
S_46	TGLO (NRI)	TNRCC	State estuaries and tidal tributaries	Water and Sediment Quality Sample Locations		Vector	
S_47	TNRCC	TCEQ	State	Surface Water Rights Diversion Points		Vector	
S_48	TNRIS	USGS	State	Active Mines and Mineral Plants			
S_49	TNRIS	TCEQ	State	Air Monitoring Sites		Vector	
S_50	TNRIS	TCEQ	State	Air Quality Nonattainment and Near Nonattainment Areas		Vector	
S_51	TNRIS		State	Airports		Vector	
S_52	TNRIS		State	Cities			
S_53	TNRIS		State	County Boundaries	1:250,000		
S_54	TNRIS		State	County Boundaries (with 15 League Limit)			
S_55	TNRIS		State	County Boundaries (with coastline)	1:24,000		
S_56	TNRIS		State	County Boundaries (with generalized coastline)	1:24,000		
S_57	TNRIS		State	Highways		Vector	
S_58	TNRIS	TCEQ	State	Industrial and Hazardous Waste Sites		Vector	
S_59	TNRIS		State	Land Use/Land Cover		Vector	
S_60	TNRIS	TCEQ	State	Landfills		Vector	
S_61	TNRIS	USGS	State	Mineral Availability System			

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
S_62	TNRIS	USGS	State	Mineral Resource Data			
S_63	TNRIS		State	National Parks			
S_64	TNRIS	TPWD	State	Natural Regions (major)		Vector	
S_65	TNRIS	TPWD	State	Natural Regions (sub)		Vector	
S_66	TNRIS		State	Precipitation			
S_67	TNRIS	TCEQ	State	Public Water Supply Sources		Vector	
S_68	TNRIS		State	Quads (1 degree blocks)		Vector	
S_69	TNRIS		State	Quads (1:100,000)		Vector	
S_70	TNRIS		State	Quads (1:12,000; 3.75 minute)		Vector	
S_71	TNRIS		State	Quads (1:24,000; 7.5 minute)		Vector	
S_72	TNRIS	TCEQ	State	Radioactive Waste Sites		Vector	
S_73	TNRIS		State	Railroads		Vector	
S_74	TNRIS		State	Reservoirs		Vector	
S_75	TNRIS	TLC	State	School District Boundaries			
S_76	TNRIS		State	State Parks			
S_77	TNRIS		State	STATSGO (soils)			
S_78	TNRIS		State	Streams		Vector	
S_79	TNRIS	TCEQ	State	Superfund Sites		Vector	
S_80	TNRIS	TCEQ	State	TCEQ Regions			
S_81	TNRIS	TLC	State	Texas House Districts			
S_82	TNRIS		State	Urban Areas			
S_83	TNRIS	TPWD	State	Vegetation Types		Vector	
S_84	TNRIS		State	zip codes			
S_85	TWDB		State	Basins		Raster	
S_86	TWDB		State	Economically Distressed Areas			
S_87	TWDB	TWDB	State	Existing Conveyances		Vector	
S_88	TWDB	BEG	State	Existing Reservoirs		Vector	
S_89	TWDB	not available	State	Groundwater Conservation Districts		Vector	
S_90	TWDB	not available	State	Groundwater Management Areas (GMA)		Vector	
S_91	TWDB	TWDB	State	Hillshade		Raster	
S_92	TWDB	USGS	State	Hydraulic Unit Code (HUC)	1:500,000	Vector	
S_93	TWDB	TWDB	State	Major Aquifers	1:250,000	Vector	
S_94	TWDB	USGS	State	Major Rivers	1:2,000,000	Vector	

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
S_95	TWDB	TWDB	State	Minor Aquifers	1:250,000	Vector	
S_96	TWDB	not available	State	OPFCA Regions and Field Office		Vector	
S_97	TWDB	TWDB	State	Priority Groundwater Management Areas (PGMA)		Vector	
S_98	TWDB	TWDB	State	Proposed Conveyances		Vector	
S_99	TWDB	BEG	State	Recommended Reservoirs		Vector	
S_100	TWDB	TWDB	State	Regional Water Planning Areas		Vector	
S_101	TWDB	not available	State	River Authorities and Special Law Districts	1:100,000 (rivers), 1:500,000 (basins)	Vector	
S_102	TWDB	USGS	State	River Basins	1:500,000	Vector	
S_103	TWDB	not available	State	StratMap County Boundaries with Coastline	1:24,000	Vector	
S_104	TWDB	not available	State	StratMap County Boundaries without Coastline	1:24,000	Vector	
S_105	TWDB	not available	State	StratMap Municipality Boundaries	1:24,000	Vector	
S_106	TWDB	not available	State	StratMap Texas State Boundary with Coastline	1:24,000	Vector	
S_107	TWDB	not available	State	StratMap Texas State Boundary without Coastline	1:24,000	Vector	
S_108	TWDB	TWDB	State	Submitted Drillers Report Database		Vector	
S_109	TWDB	TWDB	State	Terrain		Raster	
S_110	TWDB	Texas Legislative Council	State	Texas House Districts (2002)		Vector	
S_111	TWDB	Chris Daly and George Taylor	State	Texas Precipitation		Vector	
S_112	TWDB	Texas Legislative Council	State	Texas Senate Districts (2002)		Vector	
S_113	TWDB	TWDB	State	TWDB Groundwater Database Welldata		Vector	
S_114	TWDB	TWDB	State	Well Location Grid			
S_115	USEPA	USGS	State-Southeast	Multi-Resolution Land Characteristics Consortium (National Land Cover Data)		Raster	30 m
S_116	USFS	USFS	State-Southeast	LAA - Forest Area Connectivity		Raster	30 m
S_117	USFS	USFS	State-Southeast	LAA - Forest Area Density		Raster	30 m
S_118	USFS	USFS	State-Southeast	LAA - Forest Fragmentation Index		Raster	30 m
S_119	USFS	USFS	State-Southeast	LAA - Human Use Index		Raster	30 m
S_120	USFS	USFS	State-Southeast	LAA - Land Cover Contagion		Raster	30 m
S_121	USFS	USFS	State-Southeast	LAA - Land Cover Diversity		Raster	30 m

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
S_122	USFS	USFS	State-Southeast	LAA - Landscape Pattern Type Index A		Raster	30 m
S_123	USGS	USGS	State	GAP Analysis Project			

Nationwide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
	http://mrdata.usgs.gov/sddpftp.html						
N_1	USGS	USGS	Nationwide	Igneous rocks PLUTO		Vector	
N_2	USGS	USGS	Nationwide	NURE Sediment Chemistry		Raster	
N_3	USGS	USGS	Nationwide	Soil Chemistry		Vector	
N_4	USGS	USGS	Nationwide	Soils PLUTO		Vector	
N_5	USGS	USGS	Nationwide	Soils RASS		Vector	
N_6	USGS	USGS	Nationwide	Unconsolidated Sediments PLUTO		Vector	
N_7	USGS	USGS	Nationwide	Unconsolidated Sediments RASS		Vector	
N_8	USGS	USGS	Nationwide	US Geology	1:2,500,000	Raster	1000 m
N_9	USGS	USGS	Nationwide	US Geology [Geologic Faults]	1:2,500,000	Raster	1000 m
N_10	USGS	USGS	Nationwide	US Aeromagnetics		Raster	1000 m
N_11	USGS	USGS	Nationwide	US Bouguer Gravity Field		Raster	4 km
N_12	USGS	USGS	Nationwide	US Isostatic Gravity Field		Raster	4 km
N_13	USGS	USGS	Nationwide	US Magnetics NW Illumination		Raster	2 km
N_14	USGS	USGS	Nationwide	Active Mines and Mineral Plants		Vector	
N_15	USGS	USGS	Nationwide	Mineral Availability System		Vector	
N_16	USGS	USGS	Nationwide	Mineral Resource Data		Vector	
N_17	TNRIS		Nationwide	USA Boundary			
N_18	TGLO	NPS, WRD	Nationwide	National Parks	1:24,000	Vector	
N_19	USGS	USGS	Nationwide	Cities	1:2,000,000	Vector	
N_20	USGS	USGS	Nationwide	Counties		Vector	
N_21	USGS	USGS	Nationwide	Elevated Shaded Relief		Raster	2km
N_22	USGS	USGS	Nationwide	Federal Lands	1:2,000,000	Vector	
N_23	USGS	USGS	Nationwide	Hydrologic Units	1:250,000 and 1:100,000	Vector	
N_24	USGS	USGS	Nationwide	Hydrology	1:2,000,000	Vector	
N_25	USGS	USGS	Nationwide	Land Cover		Raster	1000 m
N_26	USGS	USGS	Nationwide	Railroads	1:100,000	Vector	
N_27	USGS	USGS	Nationwide	Roads	1:3,000,000	Vector	
N_28	USGS	USGS	Nationwide	Urban Areas		Vector	
N_29	USGS	USGS	Nationwide	USA	1:25,000,000	Vector	
N_30	USGS	USGS	Nationwide	24000 Quadrangle Boundaries		Vector	
N_31	USGS	USGS	Nationwide	250000 Quadrangle LU/LC	1:250,000	Vector	

Nationwide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
	www.epa.gov/mrlc/data.html (links to spatial and non-spatial data, nationwide)						
N_32	USFS	USFS	13 state region (including TX, LA, MS)	LAA - Assessment Projects by watershed		Vector	
N_33	USFS	USFS	13 state region (including TX, LA, MS)	LAA - Assessment Projects by county		Vector	
N_34	USFS	USFS	13 state region (including TX, LA, MS)	LAA - Assessment Projects by ecoregion		Vector	
N_35	USGS	USGS	Nationwide	Geology of the US			
N_36	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 Road			
N_37	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 Railroad			
N_38	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 hydrography			
N_39	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2000 water			
N_40	NRCS/USDA	NRCS/USDA	Nationwide	FEMAQ3 Flood Data	1:24,000		
N_41	NRCS/USDA	NRCS/USDA	Nationwide	8-digit hydrologic units	1:250,000		
N_42	NRCS/USDA	NRCS/USDA	Nationwide	DRG County Mosaic			
N_43	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:24,000		
N_44	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:100,000		
N_45	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:250,000		
N_46	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:24,000 map index			
N_47	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:100,000 map index			
N_48	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:250,000 map index			
N_49	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1 degree by state map index			
N_50	NRCS/USDA	NRCS/USDA	Nationwide	National Elevation Dataset			
N_51	NRCS/USDA	NRCS/USDA	Nationwide	DEM			
N_52	NRCS/USDA	NRCS/USDA	Nationwide	DOQ County Mosaic by APFO			
N_53	NRCS/USDA	NRCS/USDA	Nationwide	ErMapper Ortho Mosaic by NRCS			
N_54	NRCS/USDA	NRCS/USDA	Nationwide	National Land Cover Dataset by State			
N_55	NRCS/USDA	NRCS/USDA	Nationwide	Soil Survey Geographic (SSURGO) data base			
N_56	NRCS/USDA	NRCS/USDA	Nationwide	Annual Average Precipitation by state			
N_57	NRCS/USDA	NRCS/USDA	Nationwide	Monthly Average Precipitation by state			
	http://nationalatlas.gov/atlasftp.html						

Nationwide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
N_58	NationalAtlas	USDA/NRCS	Nationwide	Average Annual Precipitation	1:2,000,000	vector	
N_59	NationalAtlas	USGS	Nationwide	Breeding Bird Survey Routes	1:2,000,000	vector	
N_60	NationalAtlas	USGS	Nationwide	County Boundaries	1:2,000,000	vector	
N_61	NationalAtlas	USACE	Nationwide	Dams	1:2,000,000	vector	
N_62	NationalAtlas	USFS	Nationwide	Ecoregions	1:2,000,000	vector	
N_63	NationalAtlas	USFS/USGS	Nationwide	Forest Cover Types	1:2,000,000	raster	
N_64	NationalAtlas	USGS	Nationwide	Forest Fragmentation Classification	1:2,000,000	raster	
N_65	NationalAtlas	USEPA/USGS	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	1 km
N_66	NationalAtlas	USEPA	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	540 m
N_67	NationalAtlas	USEPA	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	270 m
N_68	NationalAtlas	USGS	Nationwide	Generalized Geologic Map	1:2,000,000	vector	
N_69	NationalAtlas	USGS	Nationwide	Hydrologic Unit Boundaries	1:2,000,000	vector	
N_70	NationalAtlas	USGS	Nationwide	Invasive Species_Zebra Mussels	1:2,000,000	vector	
N_71	NationalAtlas	USGS	Nationwide	Land Cover Characteristics	1:2,000,000	raster	
N_72	NationalAtlas	USGS	Nationwide	Land Cover Diversity	1:2,000,000	raster	
N_73	NationalAtlas	USGS	Nationwide	Mineral Operations_Agriculture	1:2,000,000	vector	
N_74	NationalAtlas	USGS	Nationwide	Mineral Operations_Construction	1:2,000,000	vector	
N_75	NationalAtlas	USGS	Nationwide	Mineral Operations_Ferrous Metal Mines	1:2,000,000	vector	
N_76	NationalAtlas	USGS	Nationwide	Mineral Operations_Ferrous Metals Processing Plants	1:2,000,000	vector	
N_77	NationalAtlas	USGS	Nationwide	Mineral Operations_Miscellaneous Industrial	1:2,000,000	vector	
N_78	NationalAtlas	USGS	Nationwide	Mineral Operations_Nonferrous Metal Mines	1:2,000,000	vector	
N_79	NationalAtlas	USGS	Nationwide	Mineral Operations_Nonferrous Metal Processing Plants	1:2,000,000	vector	
N_80	NationalAtlas	USGS	Nationwide	Mineral Operations_Refractory, Abrasive, and other Industrial	1:2,000,000	vector	
N_81	NationalAtlas	USGS	Nationwide	Mineral Operations_Sand and Gravel	1:2,000,000	vector	
N_82	NationalAtlas	USGS	Nationwide	Mineral Operations_Stone, Crushed	1:2,000,000	vector	
N_83	NationalAtlas	USGS	Nationwide	NAWQA Surface-Water Sampling Sites	1:2,000,000	vector	
N_84	NationalAtlas	USGS	Nationwide	North American Bat Ranges	1:2,000,000	vector	
N_85	NationalAtlas	USGS	Nationwide	Parkways and Scenic Rivers	1:2,000,000	vector	
N_86	NationalAtlas	USGS	Nationwide	Principal Aquifers	1:2,000,000	vector	
N_87	NationalAtlas	USGS	Nationwide	Public Land Survey	1:2,000,000	vector	

Nationwide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
N_88	NationalAtlas	USGS	Nationwide	Railroads	1:2,000,000	vector	
N_89	NationalAtlas	USGS	Nationwide	Realtime Streamflow Stations	1:2,000,000	vector	
N_90	NationalAtlas	USGS	Nationwide	Roads	1:2,000,000	vector	
N_91	NationalAtlas	USGS	Nationwide	Shaded Relief of North America	1:2,000,000	raster	
N_92	NationalAtlas	USGS	Nationwide	States	1:2,000,000	vector	
N_93	NationalAtlas	USGS	Nationwide	Streams and Waterbodies	1:2,000,000	vector	
N_94	NationalAtlas	USGS	Nationwide	Wilderness Areas	1:2,000,000	vector	
N_95	NationalAtlas	USGS	Nationwide	Amphibian Distributions			
N_96	NationalAtlas	USGS	Nationwide	Butterflies			
N_97	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Chinese Privet			
N_98	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Tallowtree			
N_99	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Common Gorse			
N_100	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Leafy Spurge			
N_101	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Purple Loosestrife			
N_102	NationalAtlas	USGS	Nationwide	Moths			
N_103	NationalAtlas	CDC	Nationwide	West Niles Virus_Human Cases			
N_104	NationalAtlas	CDC	Nationwide	West Niles Virus_Mosquito Surveillance			
N_105	NationalAtlas	CDC	Nationwide	West Niles Virus_Sentinel Flock Surveillance			
N_106	NationalAtlas	CDC	Nationwide	West Niles Virus_Veterinary Cases			
N_107	NationalAtlas	CDC	Nationwide	West Niles Virus_Wild Bird Cases			
N_108	NationalAtlas	CDC	Nationwide	West Niles Virus_Human Cases			
N_109	NationalAtlas	CDC	Nationwide	West Niles Virus_Mosquito Surveillance			
N_110	NationalAtlas	CDC	Nationwide	West Niles Virus_Sentinel Flock Surveillance			
N_111	NationalAtlas	CDC	Nationwide	West Niles Virus_Veterinary Cases			
N_112	NationalAtlas	CDC	Nationwide	West Niles Virus_Wild Bird Cases			
N_113	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Frequency Data			
N_114	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Botulism			
N_115	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Cholera			
N_116	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Lead Poisoning			
N_117	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_OP/CARB Poisoning			

NonGIS Digital Maps

ID	Available From	Originator/ Publisher	Location	Map	Scale
M_1	TGLO (NRI)	CCC	Beaumont-Port Arthur	Beaumont-Port Arthur Area (Coastal Zone Boundary)	
M_2	TGLO (NRI)	CCC	Galveston-Houston	Galveston-Houston Area (Coastal Zone Boundary)	
M_3	TGLO	TGLO	Sea Rim Unit T01P	Coastal Barrier Resource System Maps	1:24,000
M_4	TGLO	TGLO	Sea Rim Unit T01/T01P	Coastal Barrier Resource System Maps	1:24,000
M_5	TGLO	TGLO	McFaddin Unit TX-02P	Coastal Barrier Resource System Maps	1:24,000
M_6	TGLO	TGLO	McFaddin Unit TX-02P	Coastal Barrier Resource System Maps	1:24,000
M_7	TGLO	TGLO	McFaddin Unit TX-02P/High Island Unit T02A	Coastal Barrier Resource System Maps	1:24,000
M_8	TGLO	TGLO	High Island Unit T02A	Coastal Barrier Resource System Maps	1:24,000
M_9	TGLO	TGLO	Bolivar Peninsula Unit T03A	Coastal Barrier Resource System Maps	1:24,000
M_10	TGLO	TGLO	Bolivar Peninsula Unit T03A/T03AP	Coastal Barrier Resource System Maps	1:24,000
M_11	TGLO	TGLO	Swan Lake Unit TX-04/TX-04P	Coastal Barrier Resource System Maps	1:24,000
M_12	TGLO	TGLO	Follets Island Unit T04/T04P	Coastal Barrier Resource System Maps	1:24,000
M_13	TGLO	TGLO	Follets Island Unit T04/T04P	Coastal Barrier Resource System Maps	1:24,000
M_14	TGLO	TGLO	Galveston Island Unit TX-05P	Coastal Barrier Resource System Maps	1:24,000
M_15	TGLO	TGLO	Brazos River Complex T05/T05P	Coastal Barrier Resource System Maps	1:24,000
M_16	TGLO	TGLO	Brazos River Complex T05/T05P /Sargent Beach Unit T06P	Coastal Barrier Resource System Maps	1:24,000
M_17	TGLO	TGLO	State Coast	Interactive Map of Coastal Management Program Zone Boundaries and Coastal Counties	
M_18	TGLO	TGLO	Chambers County	Land Use Maps for Management Area Counties	
M_19	TGLO	TGLO	Galveston County	Land Use Maps for Management Area Counties	
M_20	TGLO	TGLO	Harris County	Land Use Maps for Management Area Counties	
M_21	TGLO	TGLO	Jefferson County	Land Use Maps for Management Area Counties	
M_22	TGLO	TGLO	Hardin County	Land Use Maps for Coastal Watershed Counties	
M_23	TGLO	TGLO	Jasper County	Land Use Maps for Coastal Watershed Counties	
M_24	TGLO	TGLO	Liberty County	Land Use Maps for Coastal Watershed Counties	
M_25	TGLO	TGLO	Newton County	Land Use Maps for Coastal Watershed Counties	
M_26	TGLO	TGLO	Orange County	Land Use Maps for Coastal Watershed Counties	
M_27	TGLO	TGLO	Sabine River Basin	Impaired Coastal Segments in Texas River Basins	
M_28	TGLO	TGLO	Neches River Basin	Impaired Coastal Segments in Texas River Basins	
M_29	TGLO	TGLO	Neches-Trinity Coastal Basin	Impaired Coastal Segments in Texas River Basins	
M_30	TGLO	TGLO	Trinity River Basin	Impaired Coastal Segments in Texas River Basins	

NonGIS Digital Maps

ID	Available From	Originator/ Publisher	Location	Map	Scale
M_31	TGLO	TGLO	Trinity-San Jacinto Coastal Basin	Impaired Coastal Segments in Texas River Basins	
M_32	TGLO	TGLO	San Jacinto River Basin	Impaired Coastal Segments in Texas River Basins	
M_33	TGLO	TGLO	San Jacinto-Brazos Coastal Basin	Impaired Coastal Segments in Texas River Basins	
M_34	TGLO	TGLO	State Coast	Texas Oil Spill Planning and Response Atlas Response Map Index	
M_35	TGLO (NRI)	TCCC	State Coast	Texas Coastal Management Program Atlas	
M_36	TGLO (NRI)	CCC	State Coast	Texas Coastal Zone Map	
M_37	TGLO (NRI)	CCC	State Coast	Texas Coastal Zone Map (more detailed)	
M_38	TGLO (NRI)	CCC	State Coast	Navigatable Channels on the Texas Gulf Coast	
M_39	TGLO (NRI)	CCC	State Coast	Texas Gulf Intracoastal Waterway	
M_40	TGLO (NRI)	CCC	State Coast	Texas Coastal Management Program - Map Index	
M_41	TGLO (NRI)	ELLIS	State Coast and Gulf	Land and Lease Information about state-owned submerged lands	
M_42	TWDB	TWDB	State by Basin	Reservoir Basin Plates - Map Series	
M_43	TWDB	TWDB	State by region or Entire State	Regional Water Planning Group - Map Series	
M_44	TWDB	TWDB	State by county	Colonias - Map Series	
M_45	TGLO	TGLO	State	Mean Annual Total Precipitation (inches) in Texas	
M_46	TGLO	TGLO	State	Major Surface Water Basins of Texas	
M_47	TGLO	TGLO	State	TNRCC Permit-by-Basin Approach to Wastewater Permitting	
M_48	TGLO	TGLO	State	SB 503 Priority Areas and Regional Offices	
M_49	TGLO	TGLO	State	NPDES Cities and Counties Located in the Coastal Watersheds	
M_50	TWDB	TWDB	State	Major Aquifers	1:250,000
M_51	TWDB	TWDB	State	Minor Aquifers	1:250,000
M_52	TWDB	TWDB	State	Major Surface/Groudwater Features	1:250,000 (counties and cities 1:100,000)
M_53	TWDB	TWDB	State	Major Surface Water Features	Basins@1:500,000 Rivers@1:2,000,000 Reservoirs@1:250,000
M_54	TWDB	TWDB	State	Major Texas Rivers	1:250,000
M_55	TWDB	TWDB	State	Major River Basins in Texas	1:500,000
M_56	TWDB	TWDB	State	Major River Basins in Texas over DEM	1:500,000
M_57	TWDB	TWDB	State	Wells Measured by TWDB and Cooperators	

NonGIS Digital Maps

ID	Available From	Originator/ Publisher	Location	Map	Scale
M_58	TWDB	TWDB	State	Wells Sampled by TWDB for Water Quality Analysis	
M_59	TWDB	TWDB	State	Groundwater Management Areas	
M_60	TWDB	TWDB	State	Groundwater Management Areas with Major Aquifers	Aquifers@1:250,00 GMA@1:100,000
M_61	TWDB	TWDB	State	Groundwater Management Areas with Minor Aquifers	Aquifers@1:250,00 GMA@1:100,000
M_62	TWDB	TWDB	State	Groundwater Conservation Districts	
M_63	TWDB	TWDB	State	Groundwater Conservation Districts with Groundwater Management Areas	
M_64	TWDB	TWDB	State	Groundwater Conservation Districts, Groundwater Management Areas, and Priority Groundwater Management Areas	
M_65	TWDB	TWDB	State	Groundwater Conservation Districts and Major Aquifers and Priority Groundwater Management Areas	
M_66	TWDB	TWDB	State	Regional Water Planning Groups	
M_67	TWDB	TWDB	State	OPFCA Inspection and Field Support Services Offices	
M_68	TWDB	TWDB	State	Selected River Authorities and Special Law Districts	
M_69	TWDB	TWDB	State	River Authorities and Special Law Districts	

Publications (Maps and Data)

ID	Available From	Originator/ Publisher	Location	Publication
P_1	GBIS	GBIS	Galveston Bay	Galveston Bay Bibliography
P_2	BEG		Gulf Shoreline	Changes in Gulf Shoreline Position: Mustang and North Padre Islands, Texas
P_3	TGLO	TGLO	Texas Coast	A bibliography of Texas Coastal Wetlands
P_4	TGLO (NRI)	GERG	Texas Coast	Aliphatics (Current)
P_5	TGLO (NRI)	GERG	Texas Coast	Aromatics (Current)
P_6	TGLO (NRI)	TPWD	Texas Coast	Bag Seine Sample Locations
P_7	TGLO (NRI)	TPWD	Texas Coast	Beach Seine Sample Locations
P_8	TGLO	CCC	Texas Coast	Dryland Rowcrop Agricultural Exemption Figures and Tables
P_9	USEPA	USEPA	Texas Coast	EMAP Estuaries: A report on the condition of the estuaries of the US in 1990-1993
P_10	TGLO (NRI)	TPWD	Texas Coast	Gill Net Sample Locations
P_11	TGLO	TGLO	Texas Coast	Monitoring the Impact of Dredging Activities on Coastal Wetland Resources
P_12	TGLO (NRI)	GERG	Texas Coast	Pesticides (Historical)
P_13	TGLO (NRI)	TPWD	Texas Coast	Recreational Fishing Survey Sample Locations (Ramp)
P_14	TGLO (NRI)	TPWD	Texas Coast	Recreational Fishing Survey Sample Locations (Roving Boat))
P_15	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_16	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_17	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_18	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_19	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_20	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Annual Report
P_21	TGLO	TGLO	Texas Coast	Texas Coastal Management Program Final Environmental Impact Statement
P_22	USFWS	USFWS	Texas Coast	Texas Coastal Wetlands: Status and Trends, mid-1950s to early 1990s
P_23	TGLO	TGLO	Texas Coast	Texas Coastwide Erosion Response Plan: A report to the 75th Texas Legislature
P_24	USEPA	USEPA	Texas Coast	The Ecological Condition of Estuaries in the Gulf of Mexico
P_25	TGLO (NRI)	TPWD	Texas Coast	Trawl Sample Locations
P_26	TGLO (NRI)	GERG	Texas Coast (except Sabine Lake)	Aromatics (Historical)
P_27	TGLO (NRI)	GERG	Texas Coast (except Sabine Lake)	Pesticides (Current)
P_28			Texas Coast (Upper)	Birds of the Upper Texas Coast
P_29	TGLO (NRI)	ELLIS	Texas Coast and Gulf	Land and Lease Information about state-owned submerged lands
P_30	BEG		Texas Shoreline	Texas Shoreline Change Project. Coastal Mapping of West and East Bays in the Galveston Bay System using airborne LIDAR
P_31	BEG		Texas Shoreline	Texas Shoreline Change Project. Gulf of Mexico Shoreline Change from the Brazos River to Pass Cavallo

Publications (Maps and Data)

ID	Available From	Originator/ Publisher	Location	Publication
P_32	BEG		West Bay Shoreline	Changes in Bay Shoreline Position, West Bay System, Texas
P_33	TGLO (NRI)	TNRCC	State estuaries and tidal tributaries	Water and Sediment Quality Sample Locations
P_34	CKWRI	CKWRI	State	Caesar Kleberg Wildlife Research Institute
P_35	USEPA	USEPA	State	Environmental Monitoring and Assessment Program (EMAP)
P_36	UTCRWR	UTCRWR	State	UT Center for Research in Water Resources
P_37	TWRI	TWRI	State	Various technical reports from 2003 back to 1964
P_38			National	Biodiversity and Biological Collections Web Server
P_39	USGS	USGS	National	Biological Resources Division - USGS
P_40	USEPA	USEPA	National	Environmental Monitoring and Assessment Program (EMAP) Bibliographic Database
P_41	USEPA	USEPA	National	EPA Office of Wetlands, Oceans, and Watersheds
P_42	CMI	CMI	National	Fish and Wildlife Information Exchange
P_43	USGS	NWRC	National	National Wetlands Research Center
P_44	USGS	NWRC	National	National Wetlands Research Center
P_45	PWRC	PWRC	National	Patuxent Wildlife Research Center
P_46			National	Plants National Database
P_47	NPSC	NPSC	National	Wetland Restoration Bibliography
P_48	USACE	USACE	National	Wetlands Materials Index

Databases

ID	Database	Query info down to… park	county	state	other	Who
D_1	Air Quality	yes	no	no		NPS
D_2	Air Quality	no	no	no	sampling station	TCEQ
D_3	Amphibian Counts Database	?	?	?	?	USGS
D_4	ARMI	no	no	no	no	USGS
D_5	Breeding Bird Census	?	?	?	?	USGS
D_6	Breeding Bird Survey	no	no	yes	route	USGS
D_7	Butterflies of North America	no	yes	yes		USGS
D_8	Chinese Privet	no	yes	yes		NRCS/USDA
D_9	Christmas Bird Count	?	no	yes	count	Audubon
D_10	Christmas Bird Count	no	no	no	count	USGS
D_11	eBird	yes	yes	yes	any location	
D_12	Envirofacts_Air Realeases (AIRS/AFS)		yes	yes	EPA region	EPA
D_13	Envirofacts_Environmental Radiation Ambient Monitoring System (ERAMS)		yes	yes	EPA region	EPA
D_14	Envirofacts_Multisystem Query		yes	yes	EPA region	EPA
D_15	Envirofacts_National Contaminant Occurrence Database (NCOD)		yes	yes	EPA region	EPA
D_16	Envirofacts_Toxic Release Inventory (TRI)		yes	yes	EPA region	EPA
D_17	Envirofacts_UV index		yes	yes	EPA region	EPA
D_18	Envirofacts_Water Discharge Permits (PCS)		yes	yes	EPA region	EPA
D_19	Inventory and Monitoring on National Parks	yes				NPS
D_20	MAPS	no	no	yes	region, station	USGS
D_21	Mid-Winter Bald Eagle Count	no	no	yes	route	
D_22	Mid-Winter Waterfowl Survey	no	no	yes	flyway, species, year	USFWS
D_23	Migratory Bird Data Center					USFWS/USGS
D_24	NAAMP	no	no	no	route	USGS
D_25	NARCAM	no	yes	no		USGS
D_26	National Atlas of the US					
D_27	NatureServe Explorer	no	no	yes	plant/animal, status	NatureServe
D_28	NBII			yes	lat/long coordinates	USGS
D_29	NBII Bird Conservation node					USGS
D_30	Nonindigenous Aquatic Species (NAS)	no	no	yes	HUCs (2 and 6)	USGS
D_31	NWIS Web Site	no	yes	yes	HUC, Sampling Site	USGS
D_32	NWQA Data Warehouse	no	no	no	study unit basin	USGS
D_33	PLANTS Database	no	no	yes		NRCS/USDA

Databases

ID	Database	Query info down to… park	county	state	other	Who
D_34	Project Feeder Watch	no	no	yes		Cornell Lab of Ornithology
D_35	Toxic Release Inventory Program (TRI)					TNRCC
D_36	Water Quality	yes	no	no		NPS
D_37	Water Quality	no	no	no	sampling station	TCEQ
D_38	Waterbird Monitoring Patnership	no	no	no	site_ID	USGS
D_39	Waterfowl Breeding Population and Habitat Survey	no	no	?	species, year, strata	USFWS

NatureBib Maps

NBIB_ID	Author	Year	Title
48463	No Author	1984	Flood Insurance Rate Maps: City of Beaumont, Texas, Jefferson County; City of Silsbee, Texas, Hardin County; City of Kountze, Texas, Hardin County
129909	No Author	1974	Untitled: Large 1974 Aerial Photographs
129913	No Author		Untitled: Large Aerial Photographs
130725	No Author		Untitled: Topographic Mylar Maps
128925	No Author	1968	Untitled: 1968 Aerial Photographs
129911	No Author	1980	Untitled: Large Aerial Photograph with 'Houseman' and 'Henderson' boundaries
129917	No Author		Untitled: Large Color Aerial Photograph
15692	No Author		Big Thicket National Preserve 'Lower Neches Corridor' Jasper County, Texas
129918	No Author		Untitled: Large Infrared Aerial Photograph
129914	No Author	1956	Untitled: Large Aerial Photographs, 1950s and 1930s
130124	No Author		Untitled: Mylar topographic maps - Big Thicket National Park Texas
15684	No Author		Big Thicket National Preserve 'Jack Gore Baygall Unit'
130644	No Author	1974	Untitled: Spring, 1974 Aerial Photographs
130114	No Author	1977	Untitled: Mounted Aerial Photographs
48453	No Author	1981	Flood insurance rate map City of Jasper, Texas Jasper County
59680	No Author		Hardin County Appraisal District
98612	No Author	1978	Projected land use maps, year 2000: Neches Basin LP-054
64484	No Author		Index for 1930s & 1950s Photography
128968	Agricultural Stabilization And Conservation Service	1958	Untitled: Aerial photo index maps for Hardin County, Liberty County, Tyler County, Jasper County and Polk County
53227	Aronow, Saul	1982	Geologic Map of Menard Creek Corridor, Big Sandy Creek Unit, Turkey Creek, Beaumont Creek, Loblolly, Lance Rosier, Little Pine Island Corridor, Lower Neches River Corridor, Neches Bottom and Jack Gore Baygall, Upper Neches River Corridor
514484	Barbie, Dana L, , Kasmarck, Mark C., and Campodonico, Al,	1993	Approximate altitude of water levels in wells completed in the Chicot and Evangeline aquifers in the Houston area, Texas, January-February, 1991, United States Geological Survey Prepared in cooperation with the City of Houston and the Harris Galveston Coa
514486	Barbie, Dana L, , Coplin, L. S., and Bonnet, C. W.,	1989	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, spring 1989, (United States Geological Survey) Open file report
514596	Barbie, Dana L, and Locke, Glenn L.,	1993	Ground-water withdrawals, water levels, and ground-water quality in the Houston District, Texas, with emphasis on 1985-89, Water Resources Investigations
514495	Barbie, Dana L, , Kasmarek, Mark C., and Campodonico, Al,	1991	Approximate water-level changes in wells completed in the Chicot and Evangeline aquifers, 1977-91 and 1990-91, and measured compaction, 1973-90, in the Houston-Galveston region, Texas U S Geological Survey Open file report

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514488	Barbie, Dana L, , Coplin, L. S., and Locke, Glenn L.,	1991	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, January-February 1990, U S Geological Survey Open file report
52943	Barnes, Virgil E.	1968	Geologic Atlas of Texas, Beaumont Sheet
15720	Big Thicket National Preserve		Big Thicket National Preserve Water Quality Monitoring Sites
130320	Big Thicket National Preserve		Untitled: pipeline location map
15695	Cartographer Unknown	1987	Big Thicket National Preserve Menard Creek Corridor Unit
15690	Cartographer Unknown	1974	Big Thicket National Preserve Lower Neches Area
15687	Cartographer Unknown		Big Thicket National Preserve Little Pine Island and Pine Island Bayou Corridor Unit Hardin County Texas
132500	Cartographer Unknown		Vegetation Beech Creek 1958
129708	Cartographer Unknown		Untitled: Geologic map of southeast Texas along the Gulf of Mexico
15685	Cartographer Unknown	1974	Big Thicket National Preserve Lance Rosier Area
15683	Cartographer Unknown	1977	Big Thicket National Preserve 'Jack Gore Baygall Unit'
14789	Cartographer Unknown		Beech Creek Main Tram Lines and Spurs
15712	Cartographer Unknown	1977	Big Thicket National Preserve 'Upper Neches Corridor'
72792	Cartographer Unknown		Location of rare mushroom (Hygrophorus cantharellus)
15680	Cartographer Unknown	1974	Big Thicket National Preserve Hickory Creek Area
15681	Cartographer Unknown	1975	Big Thicket National Preserve Hickory Creek Savannah Unit
15707	Cartographer Unknown	1976	Big Thicket National Preserve Six Lakes Subdivision Boundary Portion of Menard Creek Corridor
15669	Cartographer Unknown	1982	Big Thicket National Preserve Beaumont Unit
15670	Cartographer Unknown	1974	Big Thicket National Preserve Beech Creek Area
15672	Cartographer Unknown	1979	Big Thicket National Preserve Beech Creek Unit
15673	Cartographer Unknown	1974	Big Thicket National Preserve Big Sandy Area
15667	Cartographer Unknown	1974	Big Thicket National Preserve Beaumont Area
15675	Cartographer Unknown		Big Thicket National Preserve Big Sandy Creek Unit
15696	Cartographer Unknown		Big Thicket National Preserve Menard Creek Corridor Unit
129700	Cartographer Unknown		Untitled: Fuel Models Map
15713	Cartographer Unknown		Big Thicket National Preserve 'Upper Neches Corridor' Jasper County, Texas
15689	Cartographer Unknown	1975	Big Thicket National Preserve Loblolly Unit
89015	Cartographer Unknown		PA Sublett Survey (Menard Creek Unit)
15701	Cartographer Unknown	1974	Big Thicket National Preserve Pine Island Area
15698	Cartographer Unknown	1974	Big Thicket National Preserve Neches Bottom Area
15710	Cartographer Unknown		Big Thicket National Preserve Turkey Creek Unit

NatureBib Maps

NBIB_ID	Author	Year	Title
15711	Cartographer Unknown	1974	Big Thicket National Preserve Upper Neches Area
132499	Cartographer Unknown		Vegetation Beech Creek 1941
15679	Cartographer Unknown	1976	Big Thicket National Preserve Hardin County Texas Lance Rosier Unit
15691	Cartographer Unknown	1978	Big Thicket National Preserve 'Lower Neches Corridor'
15661	Cartographer Unknown		Big Thicket National Preserve 175/20,031B
77119	Cartographer Unknown		(Menard Creek Unit)
52944	Cartographer Unknown	1968	Geologic atlas of Texas, Beaumont sheet
129787	Cartographer Unknwon		Untitled: Hardin County land ownership maps
514706	Coplin, L. S, and Campodonico, Al,	1991	Records of wells, drillers' logs, water-level measurements, and chemical analyses of ground water in Harris and Galveston counties, Texas, 1984-89, U S Geological Survey Open file report
514520	Fisher, J. C.,	1982	Chemical and physical characteristics of water in estuaries of Texas, October 1976-September 1978, U S Geological Survey Open file report
12685	Fox, Dale		BBB & CRR Survey A-154
514496	Gabrysch, R. K, and Ranzau, C. E., Jr..,	1981	Approximate water-level changes in wells in the Chicot and Evangeline aquifers, 1977-81 and 1980-81, and measured compaction, 1973-81, in the Houston-Galveston region, Texas U S Geological Survey Open file report
514549	Gabrysch, R. K.,	1977	Development of ground water in the Houston District, Texas, 1970-74 U S Geological Survey Open file report
514487	Gabrysch, R. K.,	1980	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, spring 1979 and spring 1980, U S Geological Survey Open file report
514790	Gutentag, E. D, and Weeks, J. B.,	1980	The water table in the High Plains aquifer in 1978 in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, U S Geological Survey Open file report
70104	Hall, Rosine Blount Wilson, Harcombe, P. A., Hanadi, R., Arenson, A. and Bedient, P.	1994	Landcover Analysis of Big Thicket Region Using Thematic Mapper Imagery from February 10, 1991
95411	Harcombe, Paul A. and Marks, P. L.	1978	Potential Natural Vegetation of Big Thicket National Preserve
514506	Henke, Jon S, , Joyner, Thad M., and Levy, Susan S.,	1982	Beaumont Quadrangle, Texas
514566	Henry, C. D, and Basciano, J. M.,	1979	Environmental geology of the Wilcox Group lignite belt, East Texas; final report
514567	Henry, C. D, and Basciano, J. M.,	1979	Environmental geology of the Wilcox Group lignite belt, East Texas
514652	Hill, G. W, and Garrison, L. E.,	1977	Maps showing drift patterns along the North-central Texas coast, 1974-1975 Miscellaneous Field Studies Map
514587	Houser, B. B, and Ryan, G. S.,		Geology and mineral resource potential map of the Graham Creek Roadless Area, Angelina and Jasper counties, Texas, Miscellaneous Field Studies Map
514492	Kasmarek, Mark C, , Coplin, Laura S., and Campodonico, Al,	1993	Approximate changes in water levels in wells completed in the Chicot and Evangeline aquifers, 1977-93 and 1992-93, and measured compaction, 1973-92, in the Houston-Galveston region, Texas, U S Geological Survey Open file report

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514491	Kasmerak, Mark C, , Barbie, Dana L., and Campodonico, Al,	1992	Approximate changes in water levels in wells completed in the Chicot and Evangeline aquifers, 1977-92 and 1991-92, and measured compaction, 1973-91 in the Houston-Galveston region, Texas, U S Geological Survey Open file report
514705	Locke, Glenn L.,	1991	Records of wells, drillers' logs, water-level measurements, and chemical analyses of ground water in Brazoria, Fort Bend, and Waller counties, Texas, 1985-89 U S Geological Survey Open file report
514504	Lofgren, B. E.,	1977	Background studies for appraising subsidence in the Texas Gulf Coast region U S Geological Survey Open file report
514688	McGowen, M, , Basciano, J., , Rose, F. G. , , Jr.., and Fisher, W. L.,	1982	Palestine Quadrangle, Texas and Louisiana
514733	McWreath, Harry C., II, , Nelson, James D., and Fitzpatrick, Daniel J.,	1991	Simulated response to pumping stresses in the Sparta Aquifer, northern Louisiana and southern Arkansas, Water Resources Technical Report (Baton Rouge, La)
133204	Nasa, Earth Resources Laboratory National Space Technology Laboratories,	1976	Vegetation Type/land Cover Classification Derived from Landsat Multispectral Scanner Data - Big Thicket National Preserve
48458	National Flood Insurance Program,	1978	Flood Insurance Rate map, Hardin County, Texas (unincorporated areas)
514737	Neitsch, Conrad L, , Castille, Joseph J., and Jurena, Maurice R.,	1989	Soil survey of Leon County, Texas
514771	No author		Trinity Bay, Texas Land use map; Houston area
514772	No author		Trinity, Texas Land use map; Houston area
546812	No author	1979	Land use and land cover, 1973, Houston, Texas Land Use and Land Cover Maps
514635	No author	1980	Land use and land cover and associated maps of Lake Charles, Louisiana, Texas U S Geological Survey Open file report
514576	No author	1980	Federal waters; Louisiana offshore, Gulf of Mexico, showing leases and platforms
496587	No author	1980	Land use and land cover and associated maps for Alexandria, Louisiana and Texas (United States Geological Survey l978) Open file report
514663	No author	1979	National Uranium Resource Evaluation Program; Hydrochemical and stream sediment reconnaissance basic data for Palestine NTMS Quadrangle, Texas; Uranium Resource Evaluation Project
514606	No author	1980	Hydrogeochemical and stream sediment reconnaissance basic data for Beaumont NTMS Quadrangle, Texas
496547	No author	1978	Aerial radiometric and magnetic survey, Houston national topographic map, Texas Gulf Coast
514634	No author	1979	Land use and land cover and associated maps for Port Arthur, Texas, Louisiana U S Geological Survey Open file report

NatureBib Maps

NBIB_ID	Author	Year	Title
514633	No author	1981	Land use and land cover and associated maps for Port Arthur, Louisiana, Texas U S Geological Survey Open file report
514476	No author	1979	Aerial radiometric and magnetic reconnaissance survey of a portion of Texas, Beaumont and Palestine quadrangles; final report
514631	No author	1985	Land use and land cover and associated maps for Beaumont, Texas U S Geological Survey Open file report
514477	No author	1984	Aeromagnetic map of east-central Texas, U S Geological Survey Open file report
514474	No author	1980	Aerial gamma ray and magnetic survey, Mississippi and Florida airborne survey, Lake Charles and Port Arthur quadrangles of Louisiana and Texas; final report
496558	No author		Conroe, Texas, Land use map; Houston area
514603	No author		Houston, Land use map; Houston area
514669	No author		North Houston, Texas, Land use map; Houston area
514475	No author	1980	Aerial gamma ray and magnetic survey, Nebraska/Texas Project, Tyler, Texarkana, and Waco quadrangles of Texas, Oklahoma, Arkansas, and Louisiana; final report
514473	No author	1980	Aerial gamma ray and magnetic survey, Alexandria Quadrangle, Louisiana and Texas; final report
496597	Nyman, D. J.,	1984	The occurrence of high concentrations of chloride in the Chicot aquifer system of southwestern Louisiana, Water Resources Technical Report
15660	Pacific Resources, Inc.,	1968	Big Thicket National Park Texas
123492	Pattie, J.	1983	Survey of Tracts in the Lance-Rosier Unit Big Thicket National Preserve Hardin County, Texas
514583	Payne, J. N.,	1975	Geohydrologic significance of lithofacies of the Carrizo Sand of Arkansas, Louisiana, and Texas and the Meridian Sand of Mississippi, U S Geological Survey Professional Paper
130121	Radian Corporation,	1985	Untitled: Mylar overlays (for either aerial photos or topographic maps)
514485	Ranzau, C. E., Jr, and Strause, J. L.,	1982	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, spring 1982, U S Geological Survey Open file report
514489	Ranzau, C. E., Jr.,	1984	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, spring 1984, U S Geological Survey Open file report
496605	Ratzlaff, K. W, , Lind, W. B., and Ranzau, C. E.,	1983	Records of wells, drillers' logs, water-level measurements, and chemical analyses of ground water in Chambers, Liberty, and Montgomery counties, Texas, 1975-79 Report Texas Department of Water Resources
514627	Ratzlaff, K. W.,	1980	Land-surface subsidence in the Texas coastal region U S Geological Survey Open file report
496592	Shideler, G. L, and Flores, R. M.,		Maps showing distribution of heavy minerals on the South Texas outer continental shelf Miscellaneous Field Studies Map
514707	Shideler, Gerald L.,	1986	Regional geologic cross-section series of Neogene-Quaternary deposits, Louisiana continental shelf, Map and Chart Series (Geological Society of America)

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NBIB_ID	Author	Year	Title
514781	Smoot, Charles W, and Guillot, JoAnn R.,	1988	Water-level measurements 1981-85 and chemical analyses 1978-85, Red River alluvial aquifer, Red River valley, Louisiana, (United States Geological Survey) Open file report
11323	South East Texas Regional Planning Commission,		Areawide Waste Treatment Management Plan Southeast Texas Area: Land Use 1977; Land Use 1982; Land Use 1990-95
514628	St Clair, A. E, , Proctor, C. V., Jr., , Fisher, W. L., , Kreitler, C. W., and McGowen, J. H.,	1975	Land and water resources; Houston-Galveston area council Land resources laboratory map series
514500	Strause, J. L, and Ranzau, C. E., Jr.,	1982	Approximate water-level changes in wells in the Chicot and Evangeline aquifers, 1977-82 and 1981-82, and measured compaction, 1973-82, in the Houston-Galveston region, Texas U S Geological Survey Open file report
496549	Strause, J. L.,	1983	Approximate altitude of water levels in wells in the Chicot and Evangeline aquifers in the Houston area, Texas, spring 1983, U S Geological Survey Open file report
130695	Texas Forest Service,		Untitled: Texas Forest Service Maps
73436	Texas Water Quality Board,	1977	Lower Neches Basin (Plate 5(B)-location of point sources); Lower Neches Inset (Plate 4(C)-monitoring network); Lower Neches Basin (Plate 2(B) water quality planning areas); and Pine Island Bayou segment 607 (soils map)
15714	Tobin Research Inc.	1974	Big Thicket National Preserve Upper Neches Corridor Unit
15699	Tobin Research Inc.	1977	Big Thicket National Preserve Neches Bottom & Jack Gore Baygall Unit Hardin & Jasper Counties, Texas
60603	Tobin Research Inc.		Hickory Creek Area: Big Thicket National Preserve
15709	Tobin Research Inc.	1976	Big Thicket National Preserve Turkey Creek Unit
15668	Tobin Research Inc.	1977	Big Thicket National Preserve Beaumont Unit
15693	Tobin Research Inc.	1978	Big Thicket National Preserve Lower Neches Corridor Unit
69400	Tobin Research Inc.		Lance Rosier Area: Big Thicket National Preserve
14605	Tobin Research Inc.		Beaumont Area: Big Thicket National Preserve
92710	Tobin Research Inc.		Pine Island Bayou Area: Big Thicket National Preserve
73435	Tobin Research Inc.		Lower Neches Area: Big Thicket National Preserve
131252	Tobin Research Inc.		Upper Neches Area: Big Thicket National Preserve
83355	Tobin Research Inc.		Neches Bottom Area: Big Thicket National Preserve
15665	Tobin Research Inc.	1986	Big Thicket National Preserve Administration/Visitor Contact Unit Hardin County, Texas
128079	Tobin Research Inc.		Turkey Creek Area: Big Thicket National Preserve
15671	Tobin Research Inc.	1975	Big Thicket National Preserve Beech Creek Unit
15694	Tobin Research Inc.	1977	Big Thicket National Preserve Menard Creek Corridor Unit
15682	Tobin Research Inc.	1975	Big Thicket National Preserve Hickory Creek Savannah Unit

NatureBib Maps

NBIB_ID	Author	Year	Title
15686	Tobin Research Inc.	1976	Big Thicket National Preserve Lance Rosier Unit Hardin County, Texas
15688	Tobin Research Inc.	1977	Big Thicket National Preserve Little Pine Island & Pine Island Bayou Corridor Unit Hardin & Jefferson Counties, Texas
15609	Tobin Research Inc.		Big Sandy Area: Big Thicket National Preserve
15674	Tobin Research Inc.	1976	Big Thicket National Preserve Big Sandy Creek Unit
14786	Tobin Research Inc.		Beech Creek Area: Big Thicket National Preserve
72690	Tobin Research Inc.		Loblolly Area: Big Thicket National Preserve
119507	Us Fish And Wildlife Service	1978	Stream Evaluation Map State of Texas
10081	Us Geological Survey		Apparent Surface Drainage Patterns
130783	Us Geological Survey		Untitled: USGS Topographic Maps
75313	Us Geological Survey	1973	Map of Flood-Prone Areas Pine Forest Quadrangle Texas
130782	Us Geological Survey		Untitled: USGS Topographic Map - Mylar
75321	Us Geological Survey	1973	Map of Flood-Prone Areas Voth Quadrangle Texas
496591	Verbeek, E.R.; Clanton, U.S.,	1978	Map showing surface faults in the southeastern Houston metropolitan area, Texas US Geological Survey Open file report
514753	White, W. A, , Calnan, T. R., , Morton, R. A., , Kimble, R. S., , Littleton, T. G., , McGowen, J. H., , Nance, H. S., and Fisher, W. L.,	1987	Submerged lands of Texas, Beaumont-Port Arthur area; sediments, geochemistry, benthic macroinvertebrates, and associated wetlands
514494	Williams, James F., II, and Ranzau, C. E., Jr.,	1985	Approximate water-level changes in the Chicot and Evangeline aquifers, 1977-85 and 1984-85 and measured compaction, 1973-85, in Harris and Galveston counties, Texas U S Geological Survey Open file report
496550	Williams, James F., II, and Ranzau, C. E., Jr.,	1986	Approximate water-level changes in the Chicot and Evangeline aquifers, 1977-86 and 1985-86 and measured compaction, 1973-86, in Harris and Galveston counties, Texas U S Geological Survey Open file report

Abbreviations	Description	Web Site
BEG	Bureau of Economic Geology (University of Texas, Austin)	http://www.beg.utexas.edu/
CCC	Texas Coastal Coordination Council	
CIR	Color Infra-Red	
CKWRI	Caesar Kleberg Wildlife Research Institute (Texas A&M)	http://www.ckwri.tamuk.edu/
CMI	Conservation Management Unit (Virginia Tech)	http://fwie.fw.vt.edu/WWW/nframes/info.htm
DEM	Digital Elevation Model	
DLG	Digital Line Graph	
DOQQ	Digital Ortho Quarter Quadrangle	
DRG	Digital Raster Graphics	
ELLIS	Energy Land and Lease Inventory System	
EMAP	Environmental Monitoring and Assessment Program	
FEMA	Federal Emergency and Management Agency	http://www.gismaps.fema.gov/rs.shtm
GBIS	Galveston Bay Information System	
GERG	Texas A&M University Geochemical and Environmental Research Group	
LAA	Landscape Analysis and Assessment	
LOSCO	Louisiana Oil Spill Coordinator's Office	
NED	National Elevation Dataset	
NGS	National Geodetic Survey	
NHD	National Hydrography Dataset	
NOAA	National Oceanic and Atmospheric Administration	
NOS	National Ocean Service	
NPS	National Park Service	
NPSC	Northern Prairie Science Center	http://www.npsc.nbs.gov/resource/literatr/wetresto/wetresto.htm
NRCS	Natural Resource Conservation Service	http://www.nrcs.usda.gov/technical/maps.html
NRI	Natural Rescource Inventory	
NWRC	National Wetlands Research Center	
PWRC	Patuxent Wildlife Research Center	http://www.pwrc.nbs.gov/
RRC	Railroad Commission of Texas	http://www.rrc.state.tx.us/other-information/automated/itssmap.html
SARA	San Antonio River Authority	
TCEQ	Texas Commission on Environmental Quality	http://www.tceq.state.tx.us/
TCMS	Texas Centric Mapping System	
TCNRI	Texas Coastal Natural Resource Inventory	http://www.nri.state.tx.us/nri/
TGLO	Texas General Land Office	http://www.glo.state.tx.us/gisdata/gisdata.html
TLC	Texas Legislative Council	
TNRCC	Texas Natural Resource Conservation Commission	http://www.lib.utexas.edu/taro/tslac/20076/tsl-20076.html

Abbreviations	Description	Web Site
TNRIS	Texas Natural Resource Information System	http://www.tnris.state.tx.us/
TPWD	Texas Parks and Wildlife Department	
TSMS	Texas State Mapping System (State Plane Coordinate System)	
TWC	Texas Water Commission	
TWDB	Texas Water Development Board	http://www.twdb.state.tx.us/home/index.asp
TWRI	Texas Water Resources Institute	http://twri.tamu.edu/reports.php
TxDOT	Texas Department of Transportation	
USACE	United States Army Core of Engineers	http://www.wes.army.mil/el/wetlands/list.html
USEPA	United States Environmental Protection Agency	http://www.epa.gov/mrlc/data.html
USFS	US Forest Service	http://www.srs.fs.usda.gov/4803/landscapes/index.html
USFW	United States Fish and Wildlife Service	
USGS	United States Geological Survey	http://mapping.usgs.gov/products.html#digital_data
USMMS	U.S. Minerals Management Service	
UTCRWR	UT Center for Research in Water Resources	http://www.ce.utexas.edu/prof/maidment/gishydro/home.html
WRD	Water Resources Division	
NationalAtlas	National Atlas	http://nationalatlas.gov/atlasftp.html